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It is, to say the least, an unfortunate coincidence that the federal injunction against the increase of freight rates by the western roads comes at a time when the European market for our railway bonds was opening widely. The adverse effects are not merely economic and related to the law of supply and demand, but sentimental. Not only was Europe, notably France and Germany, waiting to take the overflow of railway loans from our own over-charged market, but the feeling of the individual investor was distinctly friendly, quite apart from our home conditions. It is highly probable that in time not far away the private as well as the syndicate marketings would have increased. In such matters it is well to remember the temperamental character of the European investor. To begin with, he is naturally a conservative. Living in countries with surplus capital and with a limited field for investment at home, he has placed his money much more freely abroad than the American investor—this rule applying especially to English capital. Finally, whether he lives in a kingdom like Belgium or Holland or in an empire like Germany or in a centralized republic in transition like France, or even in England, with her King, Court and aristocracy, the "governmental" idea bulks big in his fiscal sensorium. It is hard to measure the ill results to our railway credit abroad once the idea gets fixed in the foreign investor's mind that his investment in an American railway security is menaced by federal hostility and made the financial shuttlecock of our party politics. It does not take a long look into the future to see how this foreign aspect of our federal policy is a matter to be reckoned with, seriously considered and inwardly digested. Nor does it bear on our railway laws alone.

Last summer the state of Massachusetts by her legislative enactment incorporating the Boston Holding Company receded from her old hostile position against the merger of the Boston & Maine and the New Haven railway interests. At the sacrifice of legal logic Attorney-General Wickersham next withdrew his federal suit against the merger; and the attorney-general of Massachusetts announced in effect his quashing of the suits against letting the New Haven hold some 500 miles of trolley properties in the state. Now comes another retreat with the passage by the state law makers of a bill specifically allowing the New Haven to hold the Berkshire street railway system—a measure by which the state surrenders the whole principle and policy involved in the original contention. So ends, practically, a contest of a New England commonwealth against a railway corporation, lasting for some years, in its earliest stages rancorous to the last degree, intertwined with state policies, injurious to railway credit, holding up important railway improvements, prolific in legal snarls and fees of eminent attorneys and prolonging a conflict which any body of rational financiers or moderate statesmen could have settled peaceably in a fortnight. But what may almost be called the Massachusetts vendetta against the railway teaches some salutary lessons—that railway controversy cannot be settled by impulse and passion; that anti-railway litigation of an obstructive character has its limits as well as anti-railway law-making; and that in such controversies the appeal, within proper bounds, to financial interests on the one hand and the public interest in good railway service on the other, is rarely in vain. The outworking process may be slow, costly and vexatious, but it gets there at last. And the rule applies to larger areas of the railway problem than Massachusetts, albeit she supplies so vivid and telling an example.

The use of the oxy-acetylene process for welding and cutting metals in railway shops is extending rapidly and promises to become one of the essentials of first class shop equipment. It has made greater progress in other countries because the business has been handled with more intelligence. Systematic methods have been used to instruct the men in safe and effective means of handling it and plants of proper capacity have been installed. The principal reason why the process has not been more rapidly introduced here is because the manufacturers of the gas generating apparatuses have constructed them too small, and where railways have bought these small plants, which were sufficient only for a small automobile repair shop, they have been disappointed because they were not adequate for the requirements of the larger shop. In the complete and instructive article on the subject by H. W. Jacobs, which appears in this issue, it is shown that the best method of using oxy-acetylene in railway shops is to have a central supply tank for the gases and pipe it under light pressure to the various shop departments where required. The proper proportions for the gas generators and storage are given, the various burners are described and the economy of the process is demonstrated by figures showing

actual costs. There are questions relating to fire risks in connection with the process and the advantage of its use in various kinds of work about railway shops to which it has not yet been generally applied. There are also the economic features of the cheapest method of obtaining the gases and of the construction of burners which consume the least gas for a given operation. These are questions which could be investigated with advantage by a committee of the Master Mechanics' Association and a careful reading of Mr. Jacobs' article will show how important this subject can be made to railways.

One of the charms of Major Hine's book, "Letters from An Old Railway Official to His Son, a Division Superintendent," is in its constant assumption that in all of the attractive successes which the father describes for the purpose of arousing enthusiasm in the mind of the son everything depends on the energy, ambition and wisdom of the son himself. The idea that success can be imported, or borrowed, or acquired in any way but by working for it with an ambitious and active mind is not only not thought of but is ignored so completely that the only fair conclusion is that the author assumes that the son himself never thought of it. That responsibility for failure can be thrown upon the company, or on a superior officer, or on uncontrollable circumstances is treated as equally unsupposable. We have received a copy of a letter, reprinted in part in the news section, which affords gratifying evidence that in real life old railway men write instructive letters to their sons. This is especially gratifying to one who, like the editor, hears of railway work mostly in only two features, the very good—the things to which the officers point with pride—and the very bad—the accidents, disasters, failures and injustices that come to public notice through courts or state commissions or newspaper grumblings. The everyday life of the rank and file comes to light only through the book of rules—a medium as cold as the right of way of the Hudson's Bay railway in February. But, as here suggested, the really efficient engineman is one who rises above the book of rules. With enough first-class men the book of rules could be abridged one-half. Lack of interest in his "profession," the first fault mentioned in our letter, is seen everywhere. The young runner who has a father that is acquainted with railway work and who can warn him to beware of this manifestation of the hook-worm disease is fortunate indeed. One who is not so fortunate will do well to try hard to elicit an interest in himself on the part of some other man's father. A father's advice has two great virtues or advantages—sincerity on the part of the giver and knowledge of its sincerity on the part of the recipient. Any superintendent who observes the widespread prevalence of the "lack of interest" here mentioned, and the commonness of the suspicion, among short-sighted enginemen, firemen and trainmen, that the superintendent, trainmaster and other superiors do not care much for the subordinates, must feel the necessity of doing anything and everything possible to induce young employees to find someone—whether father or some other competent person—to whose advice they will give the attention which good advice deserves. Our letter writer does well to call attention to the engineman to whom other enginemen look up. Such a man should be cultivated by the superintendent. This is not orthodox doctrine, we know; for the trainmaster *ought* to give all necessary instruction; but it is a condition, not a theory, which confronts us. Whenever all young firemen who are competent to be leaders among their fellows in the strife to accomplish the highest efficiency shall have been induced to fully exercise their untried abilities, an immense advance will have been made.

We like our writer's use of the term "business." One of the dictionary definitions of the word is "an occupation that requires energy, time and thought"; surely a justification of the aptness and accuracy of the use to which the word is here put. And the young runner can well make use of one of Herbert Spencer's "business principles," namely, Do not suppose things are going right till it is proved they are going wrong, but rather suppose they are going wrong till it is proved they are going right. When all our enginemen and signalmen get fully educated up to this standard of conduct collisions will have been well-nigh abolished. Moreover, it is quite possible that the process of education in this direction is not so difficult as it is often assumed to be; for our fatherly adviser assures his son that if he will ride on the engine with successful enginemen he will be able to discover the secret of their success. This suggests the query, Do superintendents generally do all that can and should be done to inculcate in all of their enginemen the knowledge and habits of the best ones? The art of engine running is a vital element in safe railroading, and yet one of its most delicate features, the habit of observing signals and of remembering the little-used rules is nowhere systematically and thoroughly taught. The firemen who is so fortunate as to fire a year or two for a runner who is good at conveying ideas to other people's minds learns his lesson in this respect under the most favorable circumstances possible; and if the fireman himself appreciates his responsibilities the result is usually good. But this training can hardly be called systematic or thorough. What superintendent takes pains to have all of his firemen work for a time with one of the best enginemen? What evidence has anyone that even his best runners do not omit some important teaching? In an efficient school a course of education so important as the fireman's would be deemed incomplete without some post-graduate training, or at least post-graduate examinations. Many a young engineman would be saved one or more humiliating failures if he could have his knowledge of his duties reviewed and corrected by a skilful examiner about six months after his promotion. Our American railways have thousands of skilful engine runners, but in the task of spreading this skill throughout the whole force of runners there is much yet to be accomplished.

THE RAILWAYS AND THE NATION.

The fundamental conception of the railway is a commercial one. Like a factory or a mercantile house it deals in a commodity, transportation. Like a large factory corporation it has a charter. It advertises its transportation as though it were goods; and like any large private corporation it has its wage and cognate problems to solve. But the secondary conception of the railway brings to light variants from the purely commercial idea and from the theory of exclusively private rights. The most important of those divergencies are the power of eminent domain and the acute relation in which the railway, as a public service corporation, stands to public necessity and convenience. It may be added that the relation referred to not only exists but is ever in sight. A great industrial trust may control a commodity essential to life but can, to a very large degree, mask itself behind the increased price of the commodity that it sells. It is in that case a kind of indirect and disguised taxation of the consumer. Not so the railway. Its taxation, if the metaphor may be continued, is direct and immediate. It comes straight from the pocket and jostles the sensitive dollar nerve. The railway passenger who endures placidly the increased price of a single important article of household consumption—albeit he now cries out against the rise of many articles—shrieks lustily against a half cent a mile added to the fare on a railway over which, perhaps, he travels not half a dozen times a year.

In our earlier and midway times this public feeling and its expression were localized and intermittent. They had to do with particular regions on particular railway lines and were spasmodic flashes rather than flame. Once, indeed,

they took on larger size and persistency. The so-called Granger anti-railway movement, which began in 1873 and in which the western prairies were described in lurid imagery as fired by the spark of the locomotive, was that historical and exceptional case. But it was not national and its run of life was short; of frenzy shorter still. What we are seeing now in vivid, not to say alarming contrast, is the old Granger movement revived on a national scale and with many and mazy complications; the railways drawn against their will into state and federal politics; railway capital, with its vast interest identified with the prosperity of the community, placed under a kind of legislative and administrative interdict; the old "big stick" at the federal capital wielded by new hands; and, under the sway of the political and partisan *motif*, demagogical instinct encouraged to look on the railway not only as legitimate prey but as an interest to be deprived of its natural weapons of logic and justice except as they may prevail in the courts. One finds, for one example out of many, the demand of a "business" organization that a certain old and conservative railway company reduce its dividend by 2 per cent.—a demand confusing ridiculously par and market values and which, if complied with, would reduce to probably 3 per cent. the average return of investors or inheritors of the stock during the last and present generations.

In looking for the causes which have thus delocalized the anti-railway sentiment and given it a national impulse, they divide into natural and artificial groups. Among the natural forces probably the foremost is the extensive consolidation of railway properties plus greater centrality of ownership or control. As larger organizations the railways have come to touch larger and larger communities, reaching thus at last the people and the nation as a whole. The units of popular feeling have thus, so to speak, blended; and it must be conceded as another "natural" influence that, in making them unite, the abuses disclosed a few years back, not only in railway but other corporations, were powerful agencies. The trouble has not, however, been so much with railway centrality, which, on the whole, has been benign, nor with certain abuses which were malign, as with the artificial stimulants of the anti-railway sentiment. A big and complex railway situation could have been slowly but steadily readjusted, and that, too, along the lines of government "regulation," by conservative methods. Instead of that, politics have been allowed their play and say, and economic prudence has gone down under the theorem of vote-getting. And federal authority, in moving on the path of its predecessor, swallows not only economic wisdom but its own words.

But, in the lookout ahead, it is not all cloud. If, for the moment, the feeling against the railway seems on a national scale, the inevitable reaction is sure to be of like magnitude. The path to basic equity through the courts is too apt to be long and sinuous, but the key-word "reasonable" is still to be found in the judicial vocabulary as applied to railway profits. And finally, but not least, a nation but lately emerged from the grim realities of industrial and financial loss is hardly eager to challenge their hardships anew.

FEDERAL BOILER INSPECTION.

When the locomotive boiler inspection bill, fathered by the New York Public Service Commission, Second district, was under consideration, attention was directed in these columns to the fact that, as interpreted by the commission, it contained no requirement that could work any real hardship to the railways. Its provisions, as it was passed, were from the regulations in force on a majority of roads. It simply endorsed them and required them to be lived up to. The same is true of the provisions of the Pennsylvania law. In neither instance does the state interfere unduly. A small corps of inspectors keeps a general oversight, but the real work of keeping boilers in good condition is done by the usual force of boiler makers, inspectors and engineers of the railways. Their word, attested before a notary, who is a railway employee, is accepted as evidence that the work is done. The three months' inspection limit is interpreted to mean washing out and staybolt inspection. The only annoyance experienced by the railways is that occasionally it would be convenient to postpone the inspection for a few days beyond the time limit. To avoid complications this is not done, and the work is carried on quietly and systematically.

No one familiar with the facts felt there was any need for such a law, as it is well known that railway boiler inspection is the best boiler inspection in the world, and a real explosion, due to neglect to make repairs or to defective workmanship, is almost unknown. But the enactment of these laws pleased the politicians, who thought they were doing something great, and also the labor leaders, who could direct the attention of their supporters to them as legislation secured nominally in their behalf; it was of inestimable value to the few lucky ones who were fortunate enough to secure jobs as inspectors, which meant an easy livelihood, and it hurt no one but the taxpayers who paid the bills.

An attempt is being made to get a measure of an entirely different nature, but intended ostensibly for the same purpose, through Congress. Several bills have been drawn, but have met with so much opposition that no action has been taken on them. In our issue of June 11, 1909, there was a communication from a superintendent of motive power, in which attention was called to the glaring defects of the bill then pending. It was shown that it betrayed every evidence of having been drawn by someone who was quite unfamiliar with locomotive construction and unable to put down in language intelligible to an engineer what was to be done or avoided. The bill was so decidedly defective that it was withdrawn and another, No. S 6702, has been substituted. A railway officer, who spoke at one of the committee hearings in Washington, said:

> "The bill differs from the former one only in the fact that some organization is provided for, and a method of partial appeal from the decision of the inspector is mentioned. The bill contains nothing which, if it should become a law, would add to the safety of operation of locomotives, as it in no way covers the most frequent cause of locomotive boiler accidents, namely, low water."

If the bill now pending becomes a law it will put into the hands of a department of the government the direct supervision and control of the locomotive boiler inspection of the country. It gives to government inspectors full power to act, but does not hamper them with the least responsibility for the proper condition of boilers. It puts in the hands of the inspector, who must have had five years' experience as a practical boilermaker, the authority to decide on the efficiency of the design, the character of the workmanship and the strength of a boiler, old or new. It sets this man just out of his apprenticeship over the skilled designers of the railways and the locomotive builders, who have spent their lives at the work, and over the equally skilled boiler makers, on whom dependence is placed for proper construction. The absurdity of the proposition is apparent.

At first blush it would seem quite safe to grant this authority on the ground that a man so ignorant and unskilled as the proposed inspectors are apt to be would hardly dare to pit his judgment against that of those by whom a boiler was designed and built. Ordinarily this might hold. But in the hands of an inspector who "had it in," for a certain railway, the authority it is proposed to give would be a weapon of sufficient power to condemn every locomotive on the road and tie up the whole of the traffic. That there is danger of such a proceeding there can be no doubt, especially if a strike were to be threatened by an organization with which the inspector was affiliated.

Even in the hearings before the committee this spirit of vindictiveness was not only manifest, but rampant. Those

who spoke the longest, and probably the loudest, in support of the measure were men who had been going from position to position, never remaining long anywhere, and being everywhere discredited because their work was unsatisfactory. Angered because of repeated requests to quit, they gave testimony before the committee that reeked with the venom that they felt, but which would not have been admitted by any court in Christendom. And, even under the mild questioning (it could not, by any stretch of the imagination, be called cross-examination), to which they were subjected by the committee, their testimony fell to pieces. They betrayed that what they said was but the utterances of men who were venting their malice on the companies that had declined to retain them in their employment.

The committee and the promoters of the bill seemed more inclined to give attention and weight to this testimony, which was merely an arraignment of two roads for alleged neglect, than to listen to the careful analysis of the bill that had been prepared by its opponents, who showed just what its effects would be and how utterly incapable of thorough enforcement it would be. It was shown that under present conditions the inspection of boilers is a continuous performance. At the end of every run, during the run, at the regular periods of washing out and repairing, the boiler is inspected by men who are experts, each in his own line, and there is a constant stream of reports telling the responsible officers of the condition of every boiler on the road. And long before a locomotive boiler becomes in a dangerous condition from any cause except low water it becomes in a condition unsuitable for service. Long before there would be any danger in using the locomotive there are things happening which would make it uneconomical to run it; and repairs are made immediately.

To duplicate this work the bill proposes that the government shall provide itself with 300 inspectors, and that these 300 men of more or less competency shall personally inspect and certify as to the condition of every locomotive boiler in the United States. Could anything be more farcical, when single systems find it necessary to employ from 80 to 100 men to meet their own requirements?

The worthlessness of such a scheme of inspection is evident. Not only would it be worthless, but it would stand as a positive menace to the safety of the public and the employees that it is intended to protect. For though no responsibility rests on the government inspector, railway inspectors cannot fail to rely on him and will inevitably slur their work because of the inspector's certificate in the cab—a certificate that would not be of any real value because, though the powers given to inspectors are ample, there is nothing in the bill to provide that any man in the corps, from the inspector-general down, shall be competent to design a locomotive boiler, or even calculate its probable strength.

The principal objections, then, to the bill, as it stands, are that the governmental inspection will be too superficial to be of value; that it will tend to the deterioration of the railway inspection; that it gives no assurance that competent men will be employed as inspectors; that it will hamper the use of the locomotives and delay their preparation for service; that the reports of the inspectors will be too voluminous to receive attention, and that the proposed legislation is needless because more than 98 per cent. of locomotive boiler failures are due to a cause over which no law can have any control—low water. If legislation could be enacted which would prevent an engine driver from falling into one of those inexplicable lapses that allow the water to get low it would be worth while.

There seems to be little doubt that a boiler inspection bill will be passed. Furthermore, it is not at all probable that, if one were drawn that simply provided for such supervision as is required by the Pennsylvania and New York laws, there would be any opposition on the part of the railways. They do not object to supervision, but arbitrary interference is something of such a different character that, in self-defense, they are obliged to fight it. So the recommendation made by one of the opponents of the bill, that the best way in which to amend the present one is to throw it in the waste basket and start afresh with a clean sheet of paper, is to be indorsed. And if this is done it is also suggested that it would be quite the proper thing to call in an engineer or two, who have some knowledge of locomotive boiler construction and maintenance, and who can so guide the pen of the writer of the bill that his language will be understandable and not filled with the indefiniteness that characterizes the present bill. Then, instead of saddling the country with a useless expense of a million dollars a year, as proposed, let the actual inspection be done as at present, and the government confine its energies to supervision and regulation, and not attempt to duplicate work that is now done far more expeditiously and efficiently than any government bureau can hope to equal for a long time to come.

NEW BOOKS.

The Field Practice of Railway Location. By Willard Beahan, B.C.E., Division Engineer, Chicago & North Western. The Engineering News Publishing Co., New York. Second edition, revised and enlarged. Cloth; 6 in. x 9 in.; 260 pages; illustrated. Price, $3.00.

The first edition of this book was reviewed in the *Railroad Gazette* of March 10, 1905. This second edition is issued in response to a steady demand; the author has corrected all discovered errors, made some rearrangement and added some new matter. His style is vigorous and colloquial, his statements being in consequence emphatic; at times they are dogmatic. As was said in our review of the earlier edition: "The book will be interesting reading to locating engineers, and valuable and suggestive to all young men employed in railway field work."

Handbook of Cost Data for Contractors and Engineers. Second edition. By Halbert P. Gillette, Managing Editor *Engineering-Contracting.* The Myron C. Clark Publishing Co., Chicago and New York. Leather; 4¾ in. x 7 in.; 1854 + xxiv pages; illustrated. Price, $5.00.

Five years ago the first edition of this book appeared and became an indispensable reference for estimators. It has been enlarged in this second edition fourfold, or, as the author states in the preface: "The first edition of this work contained the equivalent of about 250,000 words, while this edition contains more than a million." The additional matter is cost data, nearly all of which has been published within the past five years in leading technical periodicals and in technical society proceedings. The type is somewhat smaller than that used in the first edition, so the number of pages has been increased only threefold.

The author states that much of the new matter was added for the benefit of engineers; the book having been originally compiled for contractors. After 113 pages treating on the principles of engineering economies and cost keeping, the following items are taken up: Earth excavation, 52 pages; rock excavation, quarrying and crushing, 87 pages; roads, pavements and walks, 317 pages; stone masonry, 55 pages; concrete and reinforced concrete construction, 111 pages; water works, 161 pages; sewers, 143 pages; timber-work, 114 pages; buildings, 109 pages; railways, 293 pages; bridges and culverts, 246 pages; steel and iron construction, 28 pages; engineering and surveys, 34 pages; miscellaneous cost data, 62 pages.

The work is a compilation of cost data and not a treatise on costs, the author having added merely enough original matter to assist in avoiding mistakes in using the data. The distinction between "price," the cost to the owner, and "cost," the cost to the contractor, is consistently adhered to. The author was a practicing engineer and contractor for nearly 20 years before he prepared the first edition, so the reader may feel that the book is not the work of an office man.

AUTOGENOUS WELDING IN A RAILWAY SHOP.

BY H. W. JACOBS,
Assistant Superintendent Motive Power, A., T. & S. F.

The oxy-acetylene method of autogenous welding of metals has been in use in this country, to a very limited extent, for a number of years. The feasibility of welding steel or iron by this method has been fully demonstrated, and although the possibilities of the oxy-acetylene process are very great, railways have been slow to take advantage of the savings to be made by this method. The reason is that the apparatus now on the market is very expensive and too small for railway needs. Most of the plants are unable to run over five hours with two burners without stopping to recharge.

The application to a large shop seems to have been lost sight of by the manufacturers of oxygen and acetylene, and it has been left to the railways and large manufacturing companies to develop the details themselves. Preliminary investigations covering several years were made by a western railway, and they became convinced that the oxy-acetylene process of welding metals would be both practical and economical to use in railway repair shops. It was discovered that there was but little expert knowledge that could be obtained and the development was carried on by shop employees.

Portable plants were considered undesirable, as each one would require expert attention and would necessarily be intermittent in their action, due to the charging of the gas tanks. It is necessary to purchase the oxygen in drums from a manufacturing company and as it often comes from a great distance delays in shipment of the drums would result in the entire stoppage of the welding plant. The oxygen is kept at a very high pressure, often as high as 1,800 lbs. per square inch, which would mean great difficulty in keeping the joints tight and consequent loss from leakage, as well as danger from ex-

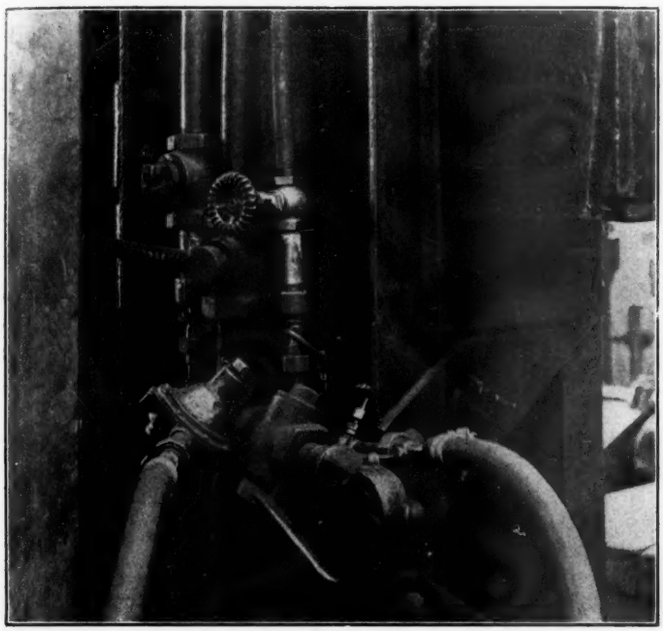


Fig. 1—Hose Connections from Pipe Line to the Burner.

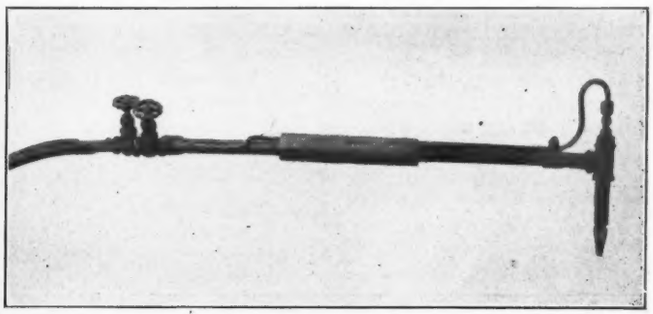


Fig. 2—Burner for Work in a Horizontal Position.

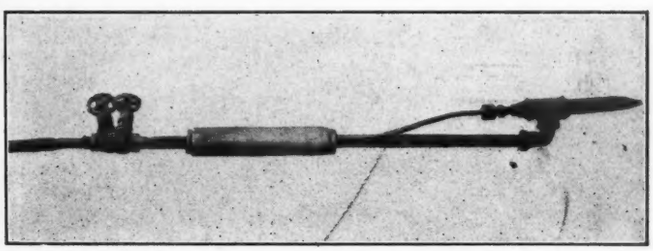


Fig. 3—Burner for Work in a Vertical Position.

Fig. 4—Welding Tubes in a Jacobs Superheater by the Oxy-Acetylene Process.

plosions. Taking everything into consideration, it was decided to build a central plant and equipment has been installed at one shop consisting of a stationary central generating plant, the oxygen and acetylene being distributed among the different shops through pipe lines.

Oxygen and Acetylene.—The oxygen is generated from calcium oxy-chloride, iron sulphate and copper sulphate, as it was found that this was cheaper than the usual chlorate of potash method and could be done with much less complicated apparatus. The oxygen passes into an ordinary gasometer where it is stored until drawn out by the compressor. Storage tanks are provided and are so arranged that any one of them may be charged or discharged independently. A pressure of from 60 to 70 lbs. per square inch is maintained in the storage tanks while the plant is in operation. This pressure is reduced to 20 lbs. as the oxygen leaves the storage tanks, in order to minimize the loss due to leakage. A separate pipe line, carrying the full storage tank pressure, is run to take care of the burner when used for the cutting process. The acetylene is generated by an automatic water-to-carbide feed generator designed by employees of the railway. A pressure of 2½ lbs. is maintained in the acetylene pipe line.

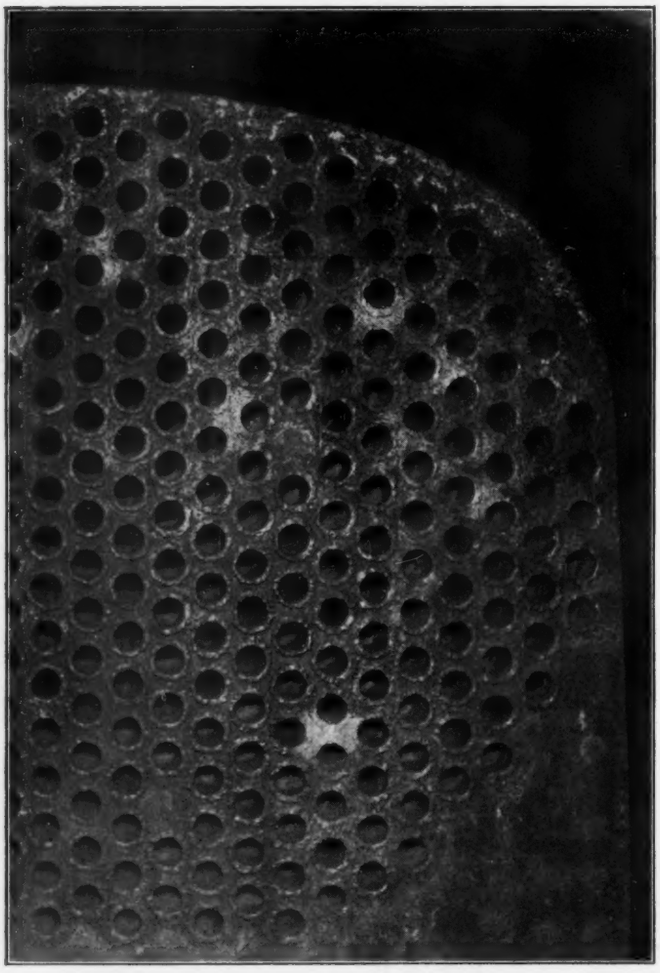


Fig. 5—Boiler Tubes Welded in Flue Sheet of Jacobs-Shupert Firebox.

Advantages of This System.—This system of generating oxygen and acetylene gives a constant supply of the gases at a constant and at the same time a minimum pressure. The great advantage is that there are no interruptions in the pressure due to shutting down the plant when a fresh charge is put in. It is also unnecessary to buy and maintain expensive high pressure receivers and fittings. There are no fluctuations due to recharging, as the plant is absolutely continuous in its operation. A sufficient stock of the necessary ingredients can be kept on hand to cover any emergency so that there is no danger of the stoppage of the plant which might result if the gases were purchased from a manufacturing company.

Shop Plant.—The plant above referred to generates about 2,000 cu. ft. of oxygen per 10-hour day, at a cost of 2 cents per cu. ft. This is less than one-half the cost if purchased in drums from a manufacturing company. This supply is sufficient to operate four burners, which makes the cost 98 cents per burner per hour, including material, labor and the expense of compressing the gas. The cost of the acetylene is 13 cents per burner per hour, thus making the total cost of the gases $1.11 per burner per hour.

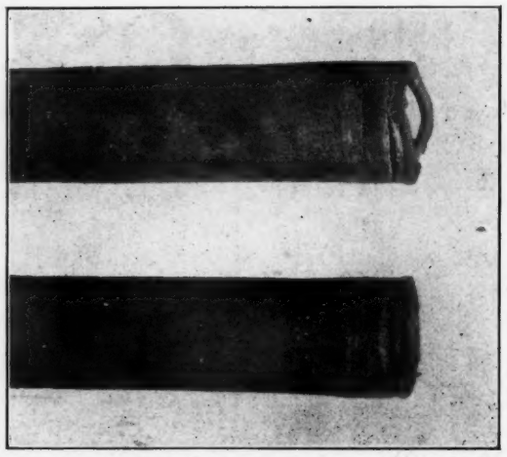


Fig. 6—Rolled and Beaded Boiler Tubes Pulled from Sheet.

The burner or blow pipe is connected by means of rubber tubes to the oxygen and acetylene pipe lines, as shown in Fig. 1. Between the opening in the oxygen pipe line and the rubber tube which connects with the oxygen pipe of the burner or blowpipe, is placed a pressure reducing valve by means of which the blowpipe operator can readily vary the pressure of oxygen in the burner, and which, when once adjusted to deliver gas at any desired pressure, will automatically maintain that pressure in the discharge line regardless of variations in the pipe line pressure. A pressure of about 10 lbs. has been found to give the best results in the burner.

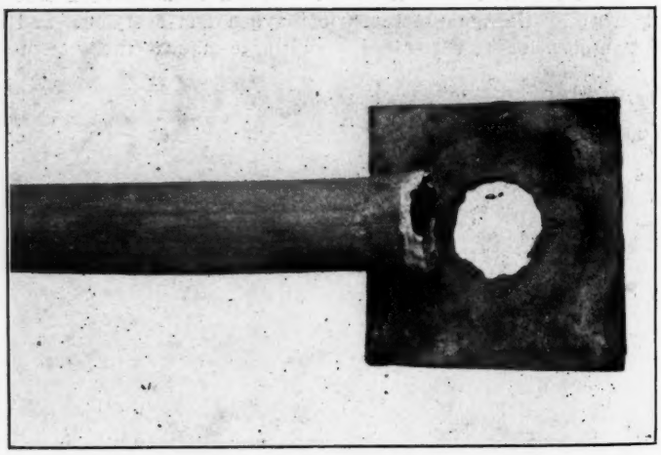


Fig. 7—Welded Tube Pulled from Sheet.

Burners.—There are two general styles of burners used in connection with the oxy-acetylene welding process, one, as shown in Fig. 2, for work in a horizontal position, and the other, as shown in Fig. 3, for work in a vertical position. The burner receives the acetylene gas from the main pipe line through a combined flash back trap and water column

pressure indicator. The flash back trap operates in such a way as to prevent the oxygen from backing up into the

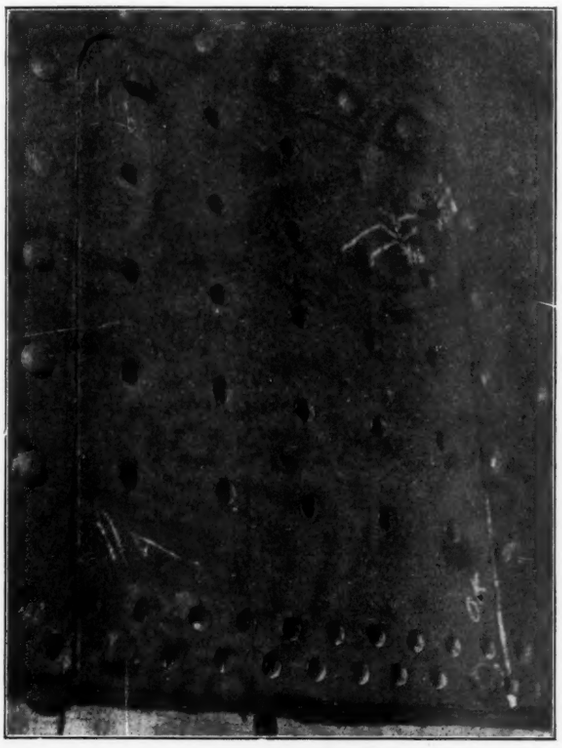


Fig. 8—Defective Part of Sheet Removed and Patch Fitted in Place.

acetylene line, or any pressure in excess of 3 lbs. from accumulating in any part of the acetylene system.

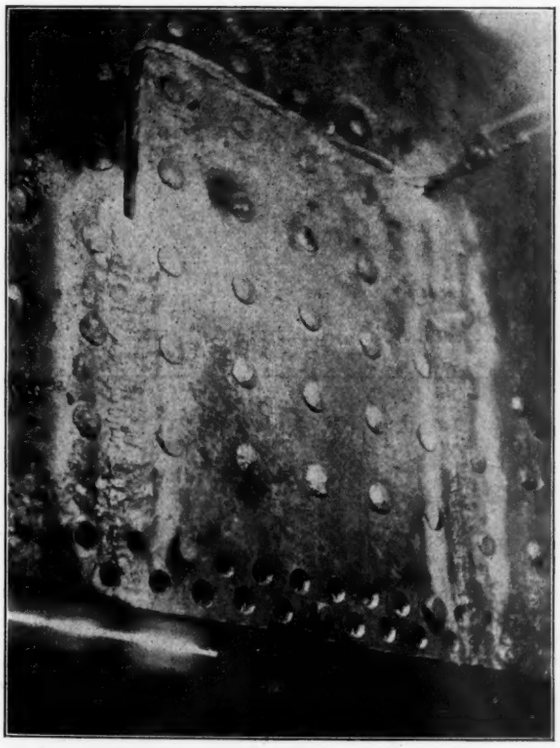


Fig. 9—Patch Partially Welded, Showing Burner in Operation.

Development of the Oxy-Acetylene Method.—The oxy-acetylene method of welding is a trade in itself and can only be mastered by gradual development. This must be carried on in an intelligent and thorough manner, and in such a way that the workman can see and know the result of his work. It is impossible to see the water side of the weld in a firebox, and we must depend on the skill of the workman in making a perfect weld. To train the workmen so that they may know the result of their work, they are provided with test pieces which are welded together and then pulled

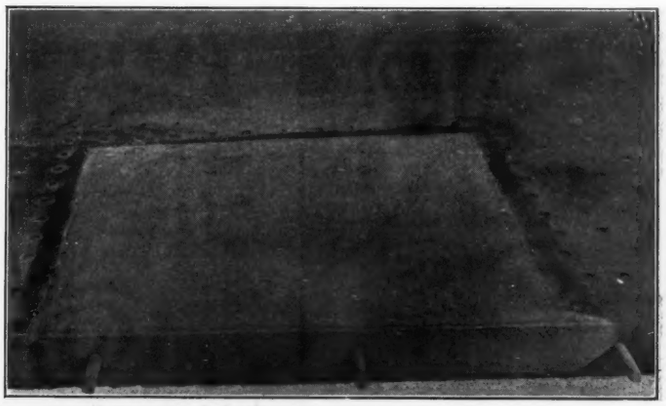


Fig. 10—Patch Welded in Firebox.

in a testing machine, which shows them the exact condition of the weld.

The oxy-acetylene process of welding is adapted to wide application in railway shops and its use is being extended every day. One of the first jobs performed at Topeka was the welding of tubes in a Jacobs superheater. This has proven so satisfactory that in the past year over 20,000 tube ends have been welded with excellent results. Fig. 4 shows the tubes

Fig. 11—Patch Welded on Outside of Firebox.

being welded in a superheater for a tandem compound locomotive. The butt joint in the wrapper sheet has also been welded. This was done before the joint was riveted.

Welding of Boiler Tubes.—Boiler flues have been welded in the flue sheet for a locomotive boiler with the Jacobs-Shupert firebox, as shown in Fig. 5. This is undoubtedly an innovation, but the excellent results obtained from welding superheater tubes have shown that it is not only entirely feasible for welding boiler tubes in the sheet, but will mean an immense saving in the course of a year in the repairs of flue leakages. The actual cost of removing, repairing and replacing 2-in. boiler flues by the usual method of rolling and

beading compared to the cost of welding flues by the oxy-acetylene process is as follows:

Operation.	Per 100	
	Rolling and beading.	Oxy-acetylene welding.
Remove complete	$2.640	$2.640
Clean	.105	.105
Cut for safe end	.525	.525
Cut to length	.315	.315
Spliced or scarfed	.335	.335
Weld (safe end)	.560	.560
Swedge	.210	.210
Anneal	.030	.030
Make safe ends	.210	.210
File holes	.100	.100
Apply copper ferrules	.430	....
Cost of copper ferrules	2.720	....
Measure for length	.220	.220
Apply and set	.890	.890
Expand, roll and bead	1.540	....
Roll and pin	....	.750
Oxy-acetylene weld	....	4.500
Roll and shim front end	.600	.600
Test	.325	.325
Totals	$11.765	$12.325

The actual cost by the welding process is about 5 per cent.

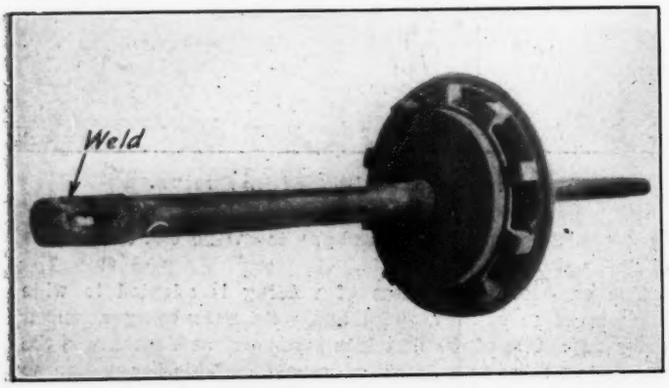


Fig. 12—Piston Rod Showing Metal Welded on End.

higher than by the usual method of rolling and expanding, but the life of the flues is extended almost indefinitely, or at least until they must be removed for some other cause than leaking at the flue sheet joint. The above cost is for welding when the flues are in a horizontal position. The welding cost is reduced about one-half when the flues are placed in a vertical position, such as welding the superheater tubes as shown in Fig. 4. Sample flues were welded into the sheet and pulled in a testing machine and compared with the usual method of

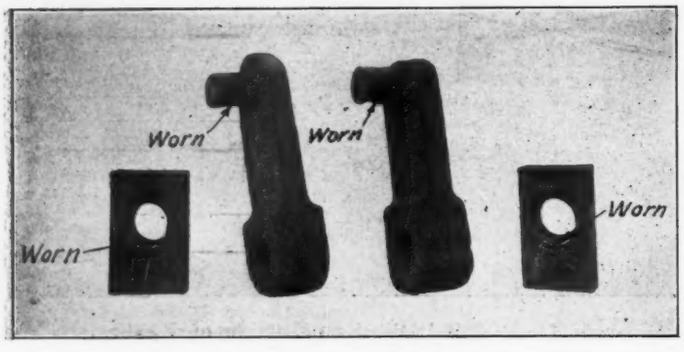


Fig. 13—Trailer Truck Hangers as Removed from Locomotive.

rolling and beading. The results of these tests are shown in Figs. 6 and 7. The welded flues offered an average resistance during the test of 34,330 lbs. as compared to 30,980 lbs. for the rolled and beaded flues, or 10.8 per cent. in favor of the welded flues. The photograph of the welded flue, Fig. 7, shows the weld was stronger than the flue, as the metal was ruptured and part of it left in the sheet.

In welding some parts it is advisable to pre-heat the metal in an ordinary forge, or with an oil burner. With a view of reducing the cost of welding flues this was tried, but it was found that it so distorted the flue sheet that nothing was gained by the practice and it was discontinued.

Firebox Welding.—This method has been successfully used in repairing locomotive fireboxes by welding in patches when it was impossible to repair the firebox in any other way. This has been done repeatedly, when it would otherwise have been necessary to put in a new firebox. Fig. 8 shows a patch in place ready to be welded and Fig. 9 shows the same patch in the process of being welded. Fig. 10 shows a large patch in a wide firebox locomotive. This patch has been in service about nine months and has given no trouble whatever. Patches are easily welded on the outside of fireboxes, as shown in Fig. 11. It is estimated that a saving in firebox renewals for a year will amount to over $35,000 in a shop which repairs locomotives at the rate of 30 per month.

The following tabulated statement shows a few examples of

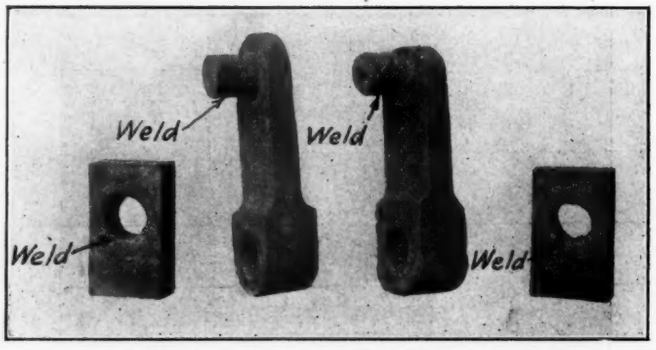


Fig. 14—Hangers Shown in Fig. 13 with Metal Welded On.

the savings that have been effected in fireboxes by the welding on of patches:

Eng. No.	Operation.	Cost—Repair	Cost—New part
1087	Crack 18 in. long in door sheet and several cracks in flue sheet welded	$18.00	.....
	Door sheet and flue sheet saved	.....	$172.00
1108	Patch 15 x 15 on right side sheet	75.00	.....
	" 12 x 22 on right side sheet		
	" 12 x 14 on fire door sheet		
	" 12 x 18 on fire door sheet		
	Engine needed new firebox	.....	800.00
2264	Patch 12 in. high around entire firebox above mud ring	90.00	.....
	Engine needed new firebox	.....	450.00
169	Patch 26 x 24 in. on right side sheet, mud ring corners patched, several other small cracks on various parts of firebox	70.00	.....
	Engine needed new firebox	.....	470.00
604	Patch 12 x 14 in. on both fire doors, several patches on side sheets, and mud ring corners patched	65.00	.....
	Engine needed new firebox	.....	700.00
345	Two patches 24 x 48 in. on side sheets and several small cracks welded	80.00	.....
	Engine needed new firebox	.....	530.00

Miscellaneous Welding.—Locomotive parts are welded and

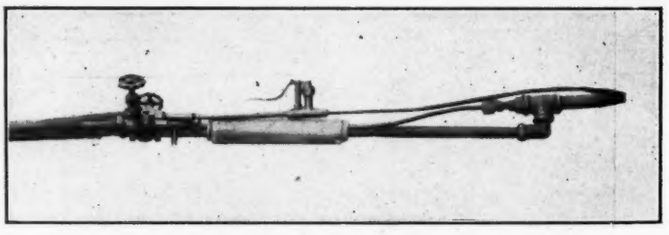


Fig. 15—Burner Used in Cutting.

saved at a trifling expense and made as good as new, when it would be impossible to repair the old part in any other way. The list of such parts is a long one, but a few of the more important ones are rocker arms, side rods, links, frame braces, eccentric blades, crossheads, piston rods, trailer hangers, valve stems, reverse lever quadrants, etc.

Fig. 12 shows a piston rod for a tandem compound locomotive that has had metal welded around the end which fits into the crosshead. This had become worn so that the rod

could no longer be used. In this case the rod was put in a forge and preheated before the oxy-acetylene torch was applied. After about ⅛ in. of stock had been added on, the rod was turned to fit the crosshead without disturbing the location of the key-way, and the crosshead was put on as it was originally. The actual costs are as follows:

Labor welding on metal	$0.38
Oxygen and acetylene	1.67
Labor turning taper	0.20
Total	$2.25

The cost of a new rod is $15, which leaves a saving of $12.75 by the expenditure of $2.25.

Trailer truck bolster hangers are removed on account of the pins becoming badly worn, as shown in Fig. 13. It would cost nearly as much to repair them in the blacksmith shop as it would to make new ones, and after they were repaired in this way, they would require as much machining as new hangers. The metal that has been worn away on the pin or in the block is replaced by the oxy-acetylene torch, as shown by Fig. 14, and the cost of machining is small because the original centers are preserved.

Cutting Burner.—A special burner, Fig. 15, is used in the

Fig. 16—Oxy-Acetylene Torch Cutting Up Scrap Firebox.

cutting process and consists of the usual burner with an additional oxygen pipe placed alongside. The tip of the pipe is pointed so as to direct the flow of oxygen toward the hottest part of the flame. The metal to be cut is first heated to the melting point by the regular burner, then the additional oxygen is turned on by pressing the spring valve.

Scrap fireboxes are considered practically worthless unless they are cut up in sheets that can be put under the shears. The cost of handling and shipping fireboxes is about as much as they will bring when sold. The oxy-acetylene process has proved to be a money saver in cutting up fireboxes into sheets. An illustration of this method is shown in Fig. 16. The price of scrap steel in uncut fireboxes is $6.05 per ton, and the same firebox cut into sheets would bring $10.75 per ton, a difference of $4.70. The firebox shown in Fig. 16 weighs about two tons and the saving would therefore amount to $9.40 if it were cut up into sheets. The entire cost of cutting by the oxy-acetylene process would amount to about $3.50. The saving thus made is exclusive of the cost of handling and shipping.

Car Truck Repairs.—The use of the oxy-acetylene process has been confined entirely to the locomotive shop, with the exception of repairs to truck bolsters, which are collected and brought to the boiler shop where the necessary repairs are made. Often small cracks appear in the steel castings which, if allowed to spread, would soon cause a rupture. An illustration of a truck bolster that has been repaired and saved is shown in Fig. 17.

The bolster cost new	$21.70
Cost of welding	1.50
Saving	$20.20

Comparative Tests of Electric and Oxy-Acetylene Welds.—Tests were made of electric and oxy-acetylene welds to show the comparative strength. The electrically welded bars came from a locomotive manufacturing company, and the oxy-acetylene welds were made by the railway company. The results are as follows:

Description.	Electric.	Oxy-acetylene.
Size of bar	1¼ x ½ in.	1⅛ x ½ in.
Tensile strength, lbs. per sq. in.	37,600	48,100
Elongation in 4 in., per cent.	2	4

These results show a decided advantage in favor of the oxy-acetylene process.

Conclusions.—The oxy-acetylene process of welding metals

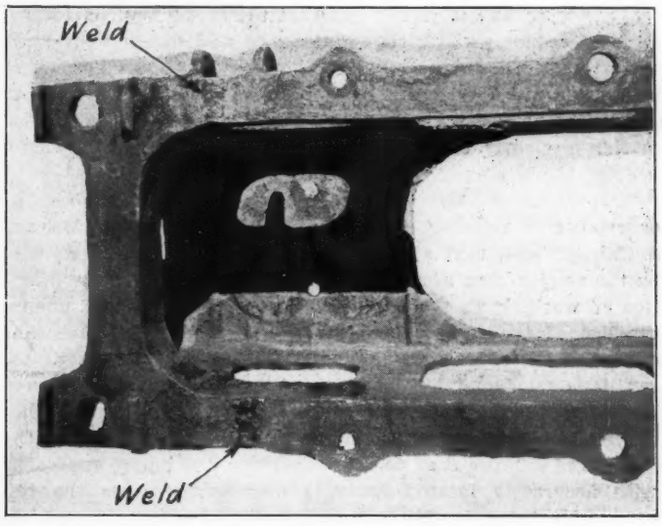


Fig. 17—Cracks Welded in Car Truck Bolster.

has now reached a practical stage of development and is worthy of a place in large manufacturing plants or railway shops. The equipment should be such that the gases are generated at a central plant and distributed in pipe lines to the various shops. A railway shop, overhauling 30 engines a month, should have a plant of sufficient size to generate 6,000 cu. ft. of oxygen per 10-hour day, which would be sufficient to operate 10 or 12 burners. If the oxygen was bought from a manufacturing company in drums containing 100 cu. ft. per drum, it would mean the handling of 60 drums a day, at a cost of more than double what it would cost in a central plant, aside from the inconvenience of handling so many drums.

There is no doubt but that a great saving can be made by the use of this process, and development should be along the lines of reducing the cost of manufacture of the gases for use in large central plants. The purpose of this article is to draw attention to the magnitude of the problem of autogenous welding. Some better and cheaper method of accomplishing the end herein referred to may be discovered, but the writer has no knowledge of anything superior to the process presented, and hopes that its study will result in the invention of improvements in the apparatus and methods suggested.

CURVE EASEMENTS; PRESENT PRACTICE.

The engineers of 56 of the more important railways have replied to questions concerning easement approaches accurately located with an instrument. These replies are fairly indicative of the progress made, inasmuch as the selections of those invited to answer were made somewhat geographically, the important roads in the East, West and South. On 20 railways easement approaches to circular curves have been put in all main line track, as well as on branches where the speeds justify it. On 9 railways more than 75 per cent. of the curves have been eased and the work is in progress. On 22 railways more or less has been done and the work is progressing. Only 5 railways report that they have not put in easement approaches on main line. On some railways the work has been done with unusual thoroughness. For example, on the Lake Shore & Michigan Southern all curves down to 20 minutes have been eased. Major Handy and Mr. Rockwell have had strong opinions on this subject and their refinement seems to be justified, for we will hazard the opinion, subject to everybody's correction, that the Lake Shore has for fast trains the easiest riding track in the world. Few railways, however, put in easement approaches for curves of one degree or less, and many, possibly the majority, limit easement approaches to curves of two degrees or more.

Comfort in riding, avoidance of swerving and unpleasant shocks to passengers, is given by most engineers as the basic reason for curve easements, but that the secondary considerations of economy in track maintenance and flange wear and some reduced drawbar pull have become important is shown by reports of curve easements on tracks reserved for freight only. The necessity for the interference of the engineer in this matter is clearly expressed by Samuel B. Fisher, chief engineer of the Missouri, Kansas & Texas.

"One of the conclusions I came to early in my engineering experience in relining curves on the Pittsburgh, Fort Wayne & Chicago was, that all curves under traffic and adjustment by the section men acquire an easement curve. But the practice of working in the easement curve by lining bars under the eye of the section boss must of necessity increase the degree of curvature near the ends of the curves." That is to say, it is the inevitable tendency of the sectionman wherever he finds the rail is receiving undue wear or strain to move the rail out, with the result that he is liable to make the approach to a curve sharper than the main curve. The spiral approach with accurately located center stakes accomplishes the reverse of this, beginning with a curve of low degree, gradually deflecting the trucks and getting the superelevation reasonably in proportion to the outward thrust.

ENGINEERING COST.

The engineering and labor cost of putting in easement approaches to circular curves in the original construction of a railway is so inconsiderable that it might be ignored altogether. But there are only a few railways in this country built originally, designed and fully prepared for heavy high-speed service. The problem of the last dozen or more years in realinement of curves on existing lines has been to adapt them to safer and more comfortable high-speed service, and this both by a reduction in the degree of curvature and in refining the approaches. The methods of setting center stakes for these approaches have varied considerably, but nearly all of them have been based either on the Searles spiral, the Holbrook spiral, the Talbot spiral, the Hood easement or the Stevens six-cord spiral. The results do not vary much. They all secure easy riding and economies.

There is a chance for a good deal of ingenuity in locating the center stakes for an approach where either the width of the right-of-way, or track structures, put an economic limit to the new location. Nevertheless, the swiftness and accuracy with which a trained transitman can proceed in this job is surprising.

When Howard L. Ingersoll, now assistant to the general manager of the New York Central, was an assistant engineer, it fell to him to do a great amount of this work. In reply to the invitation to review his own experience and attempt to ascertain something like the unit cost of setting center stakes for easement approaches, Mr. Ingersoll says:

"The amount of curvature alinement that can be done by a party of, say, one transitman, two rodmen and a man to drive stakes, costing, including expenses, perhaps $12 per diem, can do in a day is variable. A good deal depends upon the curvature and the adjacent topography. Quite a little depends upon the average amount of central angle embraced by the curve. A good deal depends upon whether it is single or double-track railway.

"Possibly such a party ought to set center line stakes accurately, for about two miles of curvature in a day, under average conditions, decreasing to perhaps a mile a day, with more arduous conditions, with sharper curves, etc.

"Suppose you assume that such a party ought to center-stake and apply easements to 100 degrees of curvature in a day, the stakes to be 50 ft. apart for curves of less than 3 degrees, and, say, 25 ft. apart for the sharper curves. One-third of the expense would be due to the application of the easements, which would give you cost of about four cents per degree of curvature for center-staking a transition curve."

COMFORT IN RIDING.

"Do you find the comfort in riding in trains increased by curve easements?"

The answers are uniformly "Yes," and rarely go beyond a positive statement of the fact, although one officer adds a significant statement: "Curve easement adds decidedly to the comfort of riding in trains and is particularly noticeable in the high-speed trains. Where curves have been eased we find that the superintendents and other operating officers desire to have other curves so treated, as they quickly notice the difference in entering and leaving curves." J. L. Campbell, engineer M. of W. of the El Paso & Southwestern: "We find that the comfort of riding is very much enhanced by the easement, which passes the train from the tangent to the curve with practically perfect smoothness of motion at all ordinary speeds. On our standard tracks, and on curves not exceeding three degrees, passengers do not detect the passage from tangent to curve at scheduled speeds, unless something besides the motion of the train attracts their attention."

REDUCED COST OF MAINTENANCE.

"Do you find by experience that accurately located easements cost more or less for maintenance and rail and flange wear than simple curves?"

Of course, no records have probably ever been kept on any railway to indicate a statistical answer. The answers given are, however, unanimous as expressions of opinion that it costs less to maintain an accurately eased curve than it costs to maintain a circular curve connected directly to a tangent and eased by rule of the thumb, as is customary among track maintenance men. For example, on the Canadian Pacific, where all curves of over one degree on the main line have accurately located spiral approaches, Mr. Schwitzer, assistant chief engineer, writes positively: "We find that accurately located easement curves cost less for maintenance and are easier on flange wear than curves which have not been spiraled." This is a typical reply, nevertheless quotations from a few others throw some additional light on the subject.

W. C. Cushing, chief engineer of maintenance of way, Pennsylvania lines West, gives a brief, valid reason for his belief: "We think that curves so lined cost less for maintenance, and less rail and flange wear, because the equipment rides more easily around them."

J. B. Berry, chief engineer of the Chicago, Rock Island & Pacific: "Experiences show that the outside rail continued into the tangent shows nearly as great a wear for considerable distances as on the main curve, particularly at the leaving end of curves. On track which carries traffic only in one direction this wear on the tangent run-off at the leaving end is very

noticeable and is due to the trucks not straightening up for some distance. There is less labor in maintaining alinement and surface at the beginning of curves that are eased than the simple curves, owing to the change of direction of leading trucks being made gradually and not concentrating the side thrust, due to changing direction of truck within a few feet."

W. D. Williams, chief engineer of the Cincinnati Northern: "All our curves have easement approaches. A main line curve without an easement properly located is a very bad thing. We have permanent monuments established at P. S. and P. C. C."

J. T. Taffany, division engineer of the Erie Railroad: "Spiral curves made mathematically accurate show a decided decrease in cost of maintenance and rail and flange wear."

A. T. Hardin, assistant general manager of the New York Central: "Easement curves cost somewhat less for maintenance, as it is easier to keep the track in proper surface and line."

E. H. McHenry, vice-president of the New York, New Haven & Hartford: "The cost of maintenance is less on account of the elimination of the tendency to throw track out of line at the point on the outer rail where the flanges first take the curve. With simple circular curves on which the superelevation is run out on the tangent all flanges seek the lower rail and upon entering the curve must change to the outer rail, resulting in impacts."

E. G. Tilton, chief engineer of the San Pedro, Los Angeles & Salt Lake: "The less shock the equipment is subjected to, the less wear and tear, consequently less cost of maintenance and rail and flange where rail easement is applied."

A. O. Cunningham, chief engineer of the Wabash: "The easements maintained to properly located points cost less for maintenance, due to uniform wearing of the rail. Where the curve is allowed to become out of line the first two or three of the outer rails at each end of the curve become flange-worn and have to be relaid."

LIMITING RATE OF SUPERELEVATION.

"Have you any limiting rate of change in superelevation of the outer rails for trains at full speed? This question is asked in view of the difficulties that occasionally arise when adhering to the old rule of ¼ in. to rail length."

This old and quite common rule has been in general use where the superelevation has been attained on the tangent and where no spiral intervened. Putting in an easement approach involves a change in the location of the center stakes. The length of the spiral is often limited by local conditions. It is limited also by the cost. The replies to this question indicate that on a spiral approach the elevation can be attained smoothly at fully twice as rapid a rate on a spiral as it can be comfortably attained on a tangent. Indeed, the rate of change seems to be no longer considered as a factor to be dealt with. There is something like unanimity in considering that the length of the spiral should be made 60 ft. for each degree of curvature to be dealt with, that is, a one-degree curve should have a 60-ft. spiral, a four-degree curve should have a 240-ft. spiral, and that the superelevation of the outer rail should be fully attained on the spiral, also that track so treated for any degree of curvature avoids undue wear and affords quite as smooth riding as on the tangent at a speed to which the superelevation is adjusted.

There seems to be also an almost universal restriction of superelevation to six inches. As to the observance of this rule: The writer was riding with the engineer of a road famous for high speed and had just observed the rate was fully 60 miles an hour, when the engineer drew down the window-shades, and said: "Within a few minutes we will pass around a three-degree curve and I would like to have you try to indicate when we reach the curve or are passing through it. The superelevation is six inches and the speed limit 55 miles an hour. I have some reason to believe, but it is unofficial, that the supervisor has got up to seven inches and that the engineman likes to go around it fast." The writer was quite unable to locate the curve and the speed was certainly not decreased.

George H. Webb, chief engineer of the Michigan Central: "In staking out our easement curves, we give the easement the length that conditions permit, without too much expense in widening cuts and fills. Where possible, we use an easement of 150 ft. to the degree and in elevating the outer rail we divide this easement into four equal parts per degree and elevate the rail for each substation; that is, first 37½-ft. substation, ½in.; second, 1 in.; third, 1½ in., and the fourth, at 150 ft., 2 in. On our main line, where trains make maximum speed, we elevate 2 in. to the degree." This is somewhat different from the practice on other roads.

Mr. Morse, of the Atchison, makes three rates of change, depending upon the physical characteristics of the country: "In mountainous country we use a rate of change which gives 1 ft. elevation in 300 ft. In a country of comparatively heavy grade, but not mountainous, a rate of change which gives 1 ft. elevation in 450 ft. In plains country, where we have light grades, we use a rate of change which gives 1 ft. of elevation in 600 ft. This latter rate gives .6 of a foot elevation on a three-degree curve at 60 miles an hour reached in a distance of 356 ft., this being the length of the easement curve."

C. K. Lawrence, chief engineer of the Central of Georgia: "We have no limiting rate of change in superelevation; it depends upon the length of the easement. I prefer much quicker rise and fall than ¼ in. to the rail length, I believe at least ½ in. to the rail length makes better riding."

George H. Burgess, chief engineer, Delaware & Hudson, gets at it in a different way: "Theoretically, it is better to select the length of spirals so that the time in which a given superelevation is attained shall be the same for all curves and for all curves and for all maximum train speeds. In our practise, the length of the spiral depends on the speed to be maintained over the division in which the curve occurs."

J. M. Morrison, engineer of the Central Vermont: "For superelevation of the outer rails we use ½ in. to each rail when we have room enough."

M. L. Byers, chief engineer M. of W. of the Missouri Pacific: "We endeavor to make the length of the spiral 60 ft. per one degree of rate of curvature, although it is sometimes impossible to do this. The elevation run-off is entirely on the spiral, occupying its entire length."

This seems to be the general prevailing practice, or rather, what the engineers aim at, although Mr. Taffany, of the Erie, makes the following practical comment: "On new locations a direct proportion per degree could be decided on, but even then it would be difficult to follow it implicitly, owing to conditions encountered necessitating a change. On existing alinement the spiral should be adapted to accord with local conditions and to clear obstacles in order to secure a minimum expense in track changes. Spirals are so flexible that judicious selection, following only general rules, will ultimately result in an eased curve approach for fast trains at all locations."

INCREASE OF SAFE SPEED LIMIT.

"Do you find the limit of speed increased because of curve easements?"

This question was somewhat carelessly worded, in some cases misunderstood, and the replies vary largely between yes, no and doubtful. W. D. Taylor, chief engineer of the Chicago & Alton, answers categorically: "We do not find the limits of safe speed increased because of curve easements." G. J. Ray, chief engineer of the Delaware, Lackawanna & Western, answers quite as categorically: "We find that the limit of safe speed is greatly increased because of curve easements." In spite of these apparently opposing statements it well may be that these two highly capable engineers do not at all disagree in fact. Curves of two degrees or less are not liable to be a factor in speed limitation. The Alton has not very sharp curves. One may have considered only the changes

made in speed limit signs, due to easements, while the other looked at possibilities.

F. Merritt, chief engineer of the Gulf, Colorado & Santa Fe: "It is somewhat difficult to answer accurately, although we consider that a spiraled curve will admit of higher safe speed than one not spiraled. Of course, this refers to high degree curves rather than low. It probably would not affect the two-degree curve to any noticeable extent."

A. T. Hardin, assistant general manager of the New York Central: "An easement curve eliminates shocks, which otherwise occur at the point of curvature and is, therefore, a factor in speed, but it is not sufficient to attempt an exact statement of it."

Edward Laas, engineer of maintenance of way, Chicago, Milwaukee & St. Paul, makes a similar logical deduction: "It is natural to suppose there will be less tendency of cars or engines to jump the track when they are permitted to enter and leave curves gradually."

NARROW GAGE CARS ON RAILWAY CONSTRUCTION.

BY G. D. BROOKE,
Division Engineer, Baltimore & Ohio.

For ditching long cuts a narrow-gage car with long flat body has been found very valuable on the Baltimore & Ohio. Such a car is illustrated in Figures 1 and 2.

It is 12 ft. in length over all; has a maximum width of 3 ft. 2 in. and a height above rail of 2 ft. 3 in. The gage is 2 ft. The body is 1 ft. deep, 3 ft. wide and 9 ft. long, inside dimensions, giving a capacity of one cu. yd. This can be increased by two cu. yds., if the grade is heavy enough to make the car run freely with the additional load, by using fixed side boards and sliding the end boards which can be removed so as not to interfere with dumping. On account of the length of the car the underframe is necessarily strong. It is built up of 2-in. x 2-in. x ½-in. angles, riveted together, as shown in the illustrations. The arrangement of rollers and U-shaped end frames makes the car easy to dump, so that little time is

Loading Narrow Gage Car.

lost in unloading. When in the normal position the body is held in place by a pin passing through corresponding holes in the center guide straps and the U-shaped end frames.

The car is run on a track laid with short ties along the berm; or, if this is too narrow, with longer ties which extend across the ditch and have bearings at each end. Such a track laid with light rail—weighing about 20 lbs. to the yd.—can be rapidly laid and easily moved in sections with a work train. The car can be handled on ordinary grades by two or three men and can be used in narrow cuts without danger of fouling the main track.

A similar car with low, long body and of such a gage as to allow it to properly clear passing trains will be found useful in handling material in and out of long tunnels where the traffic is very heavy. The congestion at such points makes work-train service very uneconomical. A standard gage truck

Dumping Narrow Gage Car.

car cannot be set off the track in the tunnel with safety. The narrow gage car, operated on its track laid close to the tunnel wall, overcomes this difficulty, keeps the tunnel gang busy and makes practical decided reductions in the cost of tunnel maintenance.

RELINING COMPOUND CURVES.

BY W. H. WILMS,
Engineer Corps, Pennsylvania Lines.

A simple and unique method of relining compound curves was devised some years ago by W. R. Hillary, engineer of maintenance of way, Pennsylvania Lines West. This method is in use on many of the divisions of the Pennsylvania Lines West, and the writer has found it to be a very effective one. It is also valuable in making an investigation of the practicability of substituting simple curves for compound, and ascertaining the amount of track lining necessary without actually staking the curve.

In this method a traverse is run around the curve in the usual way, traverse points being taken at all bridges, road crossings and at all other points where the track throw is restricted within narrow limits.

A point is taken on one tangent in the center of the track, care being used that this point is actually on the tangent or tangent produced. Intermediate points are selected between this point and a point similarly taken on the terminal tangent.

The angles and chords between the traverse points are then accurately measured. All angles should be repeated at least three times, and chords should be measured to the nearest hundredth of a foot. The traverse points should not be taken so far apart as to make chaining between them difficult or inaccurate. In some cases it is convenient and sufficient to read the angles to two or more traverse points in advance of the instrument, measuring the corresponding chords. In such a case the instrument is set up at the extreme point in advance, and not at the intermediate points, a backsight being taken on the last instrument station.

After the chords and angles of the traverse are carefully measured, the latitude and departure, referred to the initial tangent as meridian, and first traverse point as origin, of each traverse point should be figured.

To figure the traverse, the following notation will be used; referring to Fig. 4:—

P = any traverse point in center of existing track.

$\triangle op$ = central angle of curve up to point P.

C = distance from center of curve to traverse point P, measured radially.

$\Sigma\ sin_p$ = total departure of point P.

$\Sigma\ cos$ = total latitude of point P.

d = distance from initial traverse point A to $P.C.$

$P.S.$ = point of spiral.

$E.S.$ = end of spiral.

F = spiral offset.

x' = distance from $P.S.$ to $P.C.$, measured along tangent. (Taken from spiral tables.)

Referring to Fig. 1, consider the initial tangent to be the meridian of the survey, and the first traverse point A to be the origin.

Required, intersection angle and distances OA and OE. Intersection angle = sum of deflection angles = A-B-C-D-E.

Latitude of course $AB = AB\ cos\ A = Ab$.

Departure of course $AB = AB\ sin\ A = Bb$.

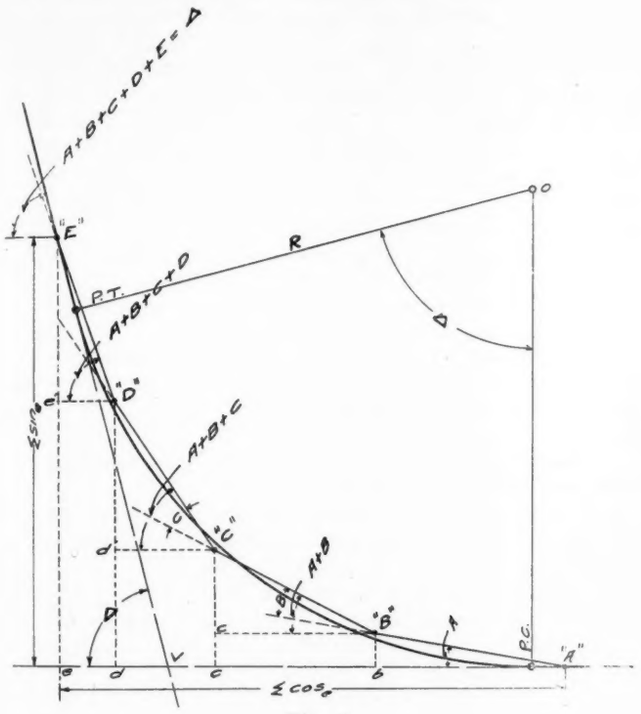


Fig. 1.

Latitude of course $BC = BC\ cos\ (A+B) = Bc$.

Departure of course $BC = BC\ sin\ (A+B) = Cc$.

The latitude of any course = length of course times cosine (deflection angle for that course + sum of all preceding deflection angles). And similarly for departures.

Now, the sum of the latitudes of each course = total latitude of point E, or

$$Ab + bc + cd + de = \Sigma\ cos_e.$$

And the sum of the departures of each course = total departure of point E, or

$$Bb + c'C + d'D + e'E = \Sigma\ sin_e.$$

In the triangle VEe

$$VE = (\Sigma\ sin_e)\ cosec\ \triangle = (\Sigma\ sin_e)\ \frac{1}{sin\ \triangle}$$

$$\text{and } Ve = (\Sigma\ sin_e)\ cot\ \triangle$$

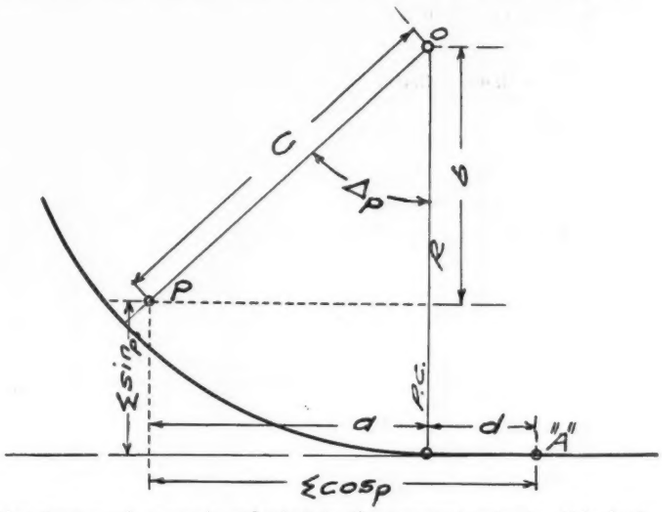
$$\text{hence } AV = \Sigma\ cos_e - Ve.$$

If the traverse consists of no more than two courses it will perhaps be easier to figure the traverse by solving the two resulting triangles.

With this data we are now able to compute the "throws"; i. e., the amount each traverse point must be moved radially in order to put it on the curve selected. This makes possible the running in of the curve by fore-sights, as the instrument is set up at points located by measuring radially the calculated throws from each respective traverse point (forward or away from the center, as the calculations indicate) and not at turning points set instrumentally, as is usually the case.

The writer has effectively used this method in running both simple and compound curves, and to lead to a clear understanding of the method, both cases will be given.

To Calculate Throws: Simple curve, Figure 2. From records the degree of curve which apparently will fit the traverse points best, and cause the least amount of throw is selected. The best curve is the one which will average the throws. If



the degree of curve is selected to the nearest minute, this last requirement will often be impossible of attainment, especially in long flat curves. As a rule, however, it is good practise to select a curve to the nearest minute for facility in staking, and where the additional cost of throwing track is small.

To find throw at P.

$$\tan = \frac{a}{b} = \frac{\Sigma\ cos_p - d}{R - \Sigma\ sin}$$

$$C = \frac{a}{sin\ \triangle}$$

Fig. 2.

$$\text{Throw} = R - C$$

If $R > C$ throw will be out.

If $R < C$ throw will be in.

Compound Curve. Figure 3.

To find throw at P.

$$\tan \triangle_p = \frac{pp''}{O_2p''}$$

$$= \frac{Ap' - AK + KP}{O_2N - Pp'' - PN} \quad \ldots \frac{a}{b}$$

$$= \frac{\Sigma\ cos_p - d + (R_2 - R_1)\ sin\ \triangle.}{R_2 - \Sigma\ sin_p - (R_2 - R_1)\ vers\ \triangle.}$$

$$\text{then } O_2p = C = \frac{a}{sin\ \triangle_p}$$

$$\text{and throw} = R_2 - C$$

Simple Curve with Spirals. Figure 4.

To find throw at *P*.

$$Op' = R + F - \Sigma \sin_{\mu} = b.$$

$$Pp' = \Sigma \cos_{\mu} - (d + x') = a.$$

$$\tan \triangle_{\mu} = \frac{a}{b}$$

$$OP = C = \frac{a}{\sin \triangle_{\mu}} \text{ and throw } = R - C$$

(radially).

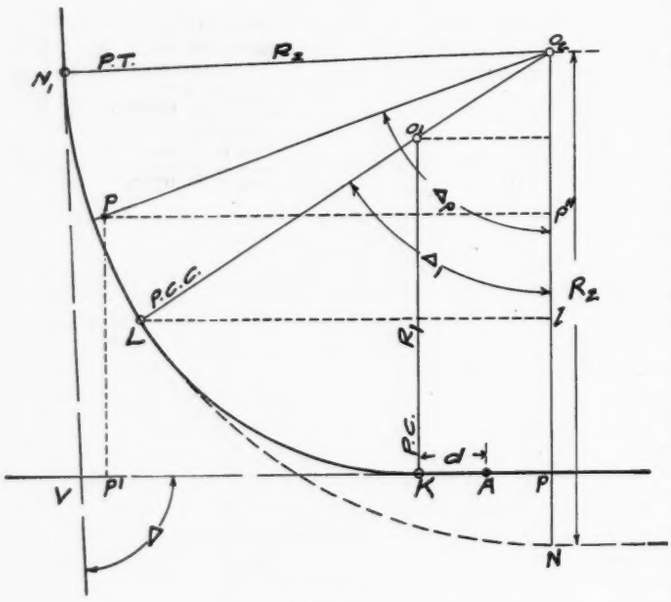


Fig. 3.

If the traverse point *A* falls between the vertex of the curve and the *P.S.* its sign will be minus.

If $R > C$ throw will be out from center.

If $R < C$ throw will be in from center.

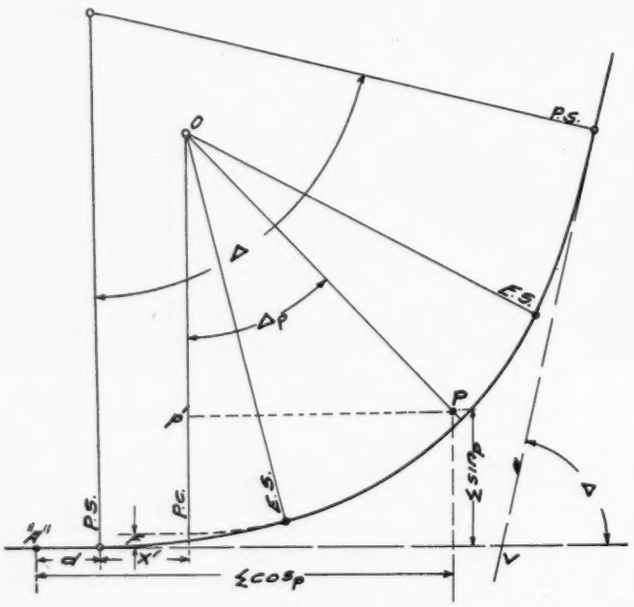


Fig. 4.

If spirals are to be inserted at the ends of the compound curve the preceding method can very easily be modified to give the desired results.

THE RAILWAY SIGNAL ASSOCIATION.

The June meeting of the Railway Signal Association was held in New York City June 14, President H. S. Balliet in the chair. About 250 members were present. The first business taken up was a discussion of the progress report of the sub-committee on standards of committee No. 1. No particular points of interest were brought out in connection with the specifications for pipe except that it was thought advisable to include a specification for galvanizing. The specifications were approved and referred to the annual meeting. In connection with the drawings, it was suggested by Mr. Kelloway that a good deal of weight might be saved by making the bracket signal base of cast steel, but the meeting approved it as drawn. The drawings of pinnacles, as well as those of the ladder foundation, concrete pipe carrier pier and lamp equipment, were recommended for adoption at the annual meeting. The drawing of binding post nut and washer was approved with the exception that it was recommended the washer be made $\frac{9}{16}$ in. x $\frac{1}{16}$ in. with the edges rounded so as not to cut wires. This was in the nature of a compromise with Mr. Waldron, who wanted cupped washers. It was brought out that should the latter be used there was liability of the workmen so placing them as to clamp a wire between two cutting edges. The drawing of the lamp was approved, except that the committee was instructed to show the door on the side opposite the lens so as to render it equally accessible with the lantern on either side of a signal post. A lamp was exhibited, showing a lens in the door in addition to the lens in the front. This latter lens was adjustable so as to be able to focus the lamp when used on a double train order signal situated on a curve.

The first part of the afternoon session was taken up with statements as to work done by the chairmen of all committees. The committee on arrangements announced that it had been unsuccessful in securing any sort of acceptable accommodations at Atlantic City and recommended that the annual meeting be held in Richmond, Va. This suggestion was approved and the matter will be submitted to letter ballot.

The secretary read a memorial to the late Henry Johnson, which was ordered sent to Mrs. Johnson.

J. H. Wisner, Jr., read a paper describing the World Signal, illustrating with lantern slides. There was no discussion. A vote of thanks was extended to Mr. Wisner.

Mr. Waldron, of the Interborough Rapid Transit Co., followed with a paper on speed control signals, which will be found in another column. As before there was no discussion, and a vote of thanks was extended.

The president then called upon W. T. Wreaks, of the Wire Inspection Bureau, for a few remarks on wire inspection. He spoke for ten minutes, emphasizing the importance of thoroughness in inspection and of comparison of results as between different users and makers.

Then followed a brief discussion of the paper on alternating current power transmission by Messrs. Rhea and Kimball, which was presented at the March meeting, but nothing new was brought out.

The afternoon session ended with a very brief and perfunctory discussion of the progress report of committee No. 4 on automatic block signals. The chief result being a request for further collaboration by the committee with the manufacturers.

The greatest of the French railways, the Paris, Lyons & Mediterranean (5,938 miles), earned net in 1909 enough for a dividend of 11.2 per cent. Its shares, 500 francs par, sell at about 1,350 francs. The Northern Railway, which has a heavier traffic than any other French system, dividend 14.4 per cent. Its shares sell for 1,775 francs. The Eastern made a dividend of 7.1 per cent.; the Southern (by the help of the state guarantee), 10 per cent.

COMPARATIVE SUMMARY OF FREIGHT CARS IN SERVICE.

RAILWAYS OF THE UNITED STATES—1908 AND 1909.

[NOTE.—Narrow-gage cars excluded. Non-revenue cars excluded. Company freight included.]

	Miles.		Freight equipment.		In-	Per cent. of	Freight cars per mile of road		Average length of haul		Freight cars: Per 1,000 freight-car miles		Freight cars: Per 1,000 rev'nue-ton miles		Rate, per ton-mile, dollars		Fr't cars per $1,000 freight earn'gs	
New England Roads.	1908.	1909.	1908.	1909.	crease.	ch'ge.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909.	1908.	1909
Boston & Maine	2,288	2,289	23,964	24,859	895	3.7	10.5	10.8	106.91	104.09	.119	.121	.0111	.0117	.01045	.01083	1.07	1.08
Central Vermont	536	536	2,866	2,730	*136	4.8	5.3	5.1	77.56	89.23	.112	.102	.0119	.0093	.00960	.00840	1.23	1.12
Maine Central	931	932	7,223	7,109	*114	1.6	7.8	7.6	81.61	88.80	.163	.157	.0150	.0141	.01062	.00995	1.42	1.42
N. Y., N. H. & Hartford.	2,047	2,044	29,821	34,184	4,363	14.6	14.6	16.7	94.83	93.77	.156	.174	.0167	.0182	.01414	.01420	1.18	1.29
Total	5,802	5,801	63,874	68,882	5,008	7.8	9.6	10.1	90.23	93.97	.138	.139	.0137	.0133	.01120	.01085	1.23	1.23
Trunk Line Roads.																		
Baltimore & Ohio	3,992	4,004	82,592	80,759	*1,833	2.2	20.7	20.1	197.77	192.25	.114	.119	.0084	.0087	.00569	.00581	1.48	1.50
Buff., Roch. & Pitts. ...	568	568	15,349	15,199	*150	1.0	27.0	26.8	145.10	155.40	.217	.238	.0118	.0122	.00493	.00482	2.40	2.53
Central of N. J.	610	610	21,247	20,181	*1,066	5.0	34.8	33.1	78.84	75.28	.165	.164	.0102	.0102	.00845	.00839	1.22	1.22
Chesapeake & Ohio	1,840	1,897	34,252	34,182	*70	0.2	18.6	18.0	274.00	275.00	.135	.122	.0076	.0067	.00432	.00410	1.75	1.64
Delaware & Hudson	845	843	21,235	21,152	*83	0.4	25.1	25.0	121.23	134.20	.156	.144	.0099	.0088	.00710	.00670	1.39	1.33
Del., Lack. & Western..	958	957	27,211	27,541	330	1.2	28.2	28.8	179.50	172.00	....	....	.0088	.0083	.00785	.00781	1.11	1.06
Erie Railroad	2,171	2,231	54,909	40,941	*3,968	7.2	25.3	22.8	168.35	183.21	.144	.124	.0097	.0085	.00600	.00586	1.62	1.48
Lehigh Valley	1,446	1,441	42,405	41,970	*435	1.0	29.3	29.1	181.08	167.71	.139	.145	.0088	.0092	.00630	.00639	1.40	1.49
N. Y. Cen. & Hud. River	3,781	3,782	61,882	64,846	2,964	4.8	16.3	17.2	197.00	193.26	.084	.083	.0069	.0066	.00643	.00631	1.21	1.19
Pennsylvania Railroad .	3,980	4,015	130,163	128,220	*1,943	1.5	32.7	31.9	167.76	158.68	.127	.113	.0077	.0066	.00569	.00580	1.33	1.16
Phila. & Reading	1,007	997	44,676	42,204	*2,472	5.5	44.4	42.3	93.76	94.23	.160	.154	.0101	.0102	.00726	.00759	1.39	1.36
Western Maryland	543	543	5,949	6,444	495	8.3	10.9	11.9	109.86	108.24	.136	.140	0085	.0082	.00655	.00620	1.30	1.32
Total	21,741	21,888	541,870	533,639	*8,231	1.1	25.1	24.4	159.52	159.12	.131	.141	.0090	.0087	.00638	.00632	1.47	1.44
Southern Classification.																		
Atlantic Coast Line ...	4,407	4,476	24,408	24,255	*153	0.6	5.5	5.4	142.52	142.09	.144	.134	.0170	.0167	.01235	.01259	1.38	1.32
Central of Georgia	1,913	1,916	10,440	10,269	*171	1.6	5.4	5.4	149.64	151.14	.152	.152	.0123	.0123	.01082	.01079	1.37	1.38
Louisville & Nashville .	4,365	4,398	40,589	41,720	1,131	2.8	9.3	9.5	172.87	174.40	.132	.130	.0101	.0098	.00779	.00763	1.30	1.28
Mobile & Ohio	926	1,114	11,247	11,066	*181	1.6	12.1	9.9	229.66	220.00	....	.113	.0099	.0096	.00631	.00621	1.58	1.55
Nash., Chat. & St. Louis	1,230	1,230	9,440	9,458	18	0.2	7.7	7.7	161.00	156.00	.300	.266	.0111	.0115	.00890	.00960	1.24	1.20
Norfolk & Western.....	1,881	1,903	37,276	35,529	*1,747	4.7	19.8	18.6	267.94	268.19	.125	.111	.0075	.0066	.00481	.00460	1.55	1.43
Seaboard Air Line	2,611	2,603	13,902	13,966	64	0.5	5.3	5.4	149.96	154.41	.135	.136	.0148	.0138	.01124	.01129	1.32	1.23
Southern Railway	7,489	7,170	54,086	51,741	*2,345	4.3	7.2	7.2	154.05	169.73	.161	.143	.0155	.0116	.00979	.00952	1.58	1.51
Total	24,822	24,810	201,388	198,004	*3,384	1.7	9.0	8.6	178.45	179.49	.164	.148	.0123	.0115	.00900	.00903	1.41	1.36
Central Classification.																		
Chic., Ind. & Louisville.	616	616	5,563	5,999	436	7.8	9.0	9.7	146.00	143.00	.155	.176	.0135	.0142	.00822	.00825	1.64	1.72
Cin., Ham. & Dayton ..	1,038	1,036	12,704	12,528	*176	1.4	12.2	12.0	114.19	124.13	.197	.190	.0136	.0125	.00624	.00529	2.27	2.28
C. C. C. & St. Louis ...	1,982	1,982	22,670	22,123	*547	2.4	11.4	11.7	146.20	152.70	.100	.089	.0079	.0064	.00568	.00544	1.44	1.33
Grand Rapids & Indiana	592	587	3,233	3,226	*7	0.2	5.5	5.5	95.99	104.95	.107	.095	.0092	.0072	.00730	.00666	1.25	1.08
Lake Erie & Western ..	886	886	4,663	4,237	*426	9.1	5.0	4.8	120.40	123.54	.116	.096	.0092	.0069	.00738	.00686	1.33	1.07
Lake Shore & Mich. So.	1,511	1,663	34,549	34,231	*318	0.9	22.9	20.6	173.50	163.00	.091	.082	.0068	.0057	.00525	.00518	1.33	1.15
Michigan Central	1,746	1,746	18,579	18,249	*330	1.8	10.6	10.5	171.00	162.00	.076	.072	.0068	.0060	.00627	.00626	1.09	1.00
N. Y., Chic. & St. Louis	523	523	11,877	11,716	*161	1.4	22.7	22.4	229.00	205.00	.086	.087	.0071	.0071	.00526	.00516	1.50	1.42
Pennsylvania Company.	1,416	1,416	53,044	53,163	119	0.2	37.4	37.5	79.93	77.26	.172	.149	.0113	.0086	.00610	.00595	1.81	1.45
P. C. C. & St. Louis ...	1,472	1,469	22,905	23,008	103	0.5	15.6	15.7	118.07	117.39	.084	.077	.0071	.0060	.00640	.00641	1.07	0.93
Pere Marquette	2,298	2,285	18,858	19,641	783	0.2	9.4	9.4	99.78	101.17	.132	.110	.0100	.0088	.00690	.00669	1.41	1.32
Vandalia	829	827	7,832	7,849	17	4.1	8.2	8.6	169.01	180.44	.148	.137	.0117	.0109	.00602	.00577	2.09	2.02
Total	14,909	15,036	216,477	215,970	*507	0.2	14.2	14.4	146.92	137.88	.122	.113	.0096	.0084	.00642	.00649	1.52	1.39
Western Classification.																		
Atch., Top. & Santa Fe	9,431	9,793	51,834	51,445	*389	0.8	5.5	5.3	392.24	363.53	.089	.087	.0065	.0067	.00949	.01026	0.84	0.80
Chicago & Alton	998	998	10,395	12,067	1,672	16.0	10.4	12.1	151.85	151.28	.112	.117	.0076	.0082	.00610	.00570	1.36	1.58
Chic. & Eastern Illinois	957	966	19,983	18,925	*1,058	5.3	20.9	19.6	156.19	159.41	.192	.199	.0105	.0108	.00470	.00480	2.34	2.36
Chic. & North Western.	7,632	7,638	57,620	58,453	833	1.4	7.6	7.3	158.07	148.31	.177	.175	.0119	.0120	.00870	.00900	1.37	1.34
Chic., Bur. & Quincy ...	9,282	9,279	53,156	51,741	*1,415	2.7	5.7	5.6	240.82	239.74	.099	.093	.0068	.0066	.00800	.00790	1.00	0.98
†Chicago Gt. Western..	818	1,476	7,939	10,649	2,710	34.1	9.7	7.2	267.71	235.32	.105	.112	.0094	.0086	.00645	.00688	1.46	1.43
Chic., Mil. & St. Paul ..	7,301	7,297	44,086	43,692	*394	0.9	6.0	6.0	190.17	183.69	.095	.091	.0077	.0074	.00811	.00838	1.09	1.03
Chic., Rk. Isl. & Pacific.	7,970	8,026	39,581	37,448	*2,133	5.4	4.9	4.7	221.40	212.76	.105	.098	.0087	.0079	.00940	.00940	1.04	0.96
Chic., St. P., M. & Om.	1,730	1,739	12,430	12,430	...	0.0	7.2	7.1	140.17	144.77	....	.204	.0134	.0130	.00893	.00903	1.50	1.44
Colorado & Southern ..	1,952	1,980	9,166	8,649	*517	5.6	4.7	4.4	132.00	138.00	.130	.114	.0093	.0077	.01034	.01067	0.92	0.82
Denver & Rio Grande ..	2,499	2,534	11,673	11,668	*5	0.0	4.7	4.6	117.02	108.38	.137	.126	.0108	.0086	.01330	.01310	0.81	0.76
Duluth, S. S. & Atlantic	595	594	2,813	2,804	*9	0.3	4.7	4.7	61.40	67.23	....	....	.0155	.0163	.00987	.00951	1.57	1.72
Great Northern	6,637	6,878	42,131	42,280	149	0.4	6.3	6.1	268.00	267.55	.128	.129	.0070	.0074	.00780	.00810	1.05	1.07
Illinois Central	4,594	4,551	60,871	60,113	*758	1.2	13.2	13.2	241.09	242.91	.130	.128	.0084	.0083	.00586	.00596	1.72	1.67
Iowa Central	558	558	2,924	3,418	494	16.9	5.2	6.1	175.65	162.71	.110	.130	.0069	.0085	.00592	.00616	1.23	1.45
Kansas City Southern ..	827	827	7,148	6,908	*240	3.4	8.6	8.3	278.64	261.29	.111	.110	.0069	.0071	.00723	.00749	1.07	1.04
Minn. & St. Louis	1,027	1,027	3,942	4,386	444	11.3	3.8	4.3	105.25	102.84	.192	.206	.0145	.0152	.01063	.01075	1.54	1.57
M., St.P. & S. Ste. Marie	2,308	2,395	12,762	12,624	*138	1.1	5.5	5.3	213.65	234.18	.154	.146	.0118	.0116	.00814	.00793	1.63	1.46
Missouri Pacific	6,479	6,489	41,295	39,044	*2,251	5.4	6.4	6.0	218.59	214.13	.128	.113	.0090	.0083	.00685	.00704	1.31	1.18
Miss., Kansas & Texas..	3,072	3,072	22,417	22,031	*386	1.7	7.3	7.2	236.57	219.94	.136	.131	.0147	.0136	.01010	.01042	1.45	1.31
Northern Pacific	5,649	5,733	42,171	41,498	*673	1.6	7.4	7.2	325.60	313.10	.125	.114	.0082	.0066	.00900	.00895	0.90	0.86
St. Louis & San Fran..	5,064	5,251	29,984	26,677	*3,307	11.0	5.9	5.1	154.80	150.29	.140	.125	.0106	.0090	.00970	.01010	1.25	1.04
St. Louis Southwestern.	1,464	1,470	9,452	9,109	*343	3.6	6.5	6.2	240.82	243.22	.149	.139	.0133	.0127	.01010	.01080	1.32	1.18
San An. & Aransas Pass	724	724	1,611	2,150	539	33.5	2.2	3.0	160.80	159.36	.093	.104	.0098	.0111	.01472	.01513	0.75	0.80
Southern Pacific	9,834	9,977	42,677	43,444	767	1.8	4.3	4.4	270.53	256.52	.077	.089	.0054	.0060	.01097	.01154	0.60	0.62
Texas & Pacific	1,885	1,885	11,212	10,917	*295	2.6	5.9	5.8	185.06	185.00	.114	.103	.0122	.0108	.01030	.01030	1.19	1.07
Union Pacific	5,781	6,062	25,040	26,025	985	3.9	4.3	4.3	402.77	383.70	.067	.065	.0040	.0041	.00826	.00845	0.47	0.48
Wabash	2,514	2,515	22,979	22,910	*69	0.3	9.1	9.1	225.23	219.11	.092	.088	.0072	.0073	.00573	.00582	1.34	1.33
Wisconsin Central	1,023	976	7,632	8,098	466	6.1	7.5	8.3	179.32	176.50	.158	.163	.0096	.0097	.00672	.00659	1.43	1.47
Total	110,605	112,710	706,924	701,603	*5,321	0.7	6.4	6.2	210.74	204.99	.124	.125	.0096	.0090	.00867	.00883	1.23	1.20
Total all roads	177,879	180,245	1,730,533	1,718,098	*12,435	0.7	9.7	9.5	178.11	287.69	.130	.128	.0100	.0094	.00803	.00808	1.34	1.30

* Decrease. † Chicago Great Western figures for 1909 include proprietary lines. In 1908 the latter were not included. Figures not kept separate for 1909.

FREIGHT CARS IN SERVICE IN 1900 AND 1909.

[NOTE.—Narrow-gage cars excluded. Non-revenue cars excluded. Company freight included.]

	Miles.		Freight equipment.		Increase.	Per cent. of ch'nge.	Freight cars per mile of road		Average length of haul.		Freight cars—Per 1,000 freight-car miles.		Freight cars—Per 1,000 rev'nue-ton miles.		Rate, per ton-mile, dollars.		Fr't cars per $1,000 freight earn'gs	
New England Roads.	1900.	1909	1900.	1909.			1900.	1909.	1900.	1909.	1900.	1909.	1900.	1909.	1900.	1909.	1900.	1909.
Boston & Maine	1,787	2,289	12,230	24,859	12,629	103.3	6.8	10 8	66.99	104.09	.126	.121	.0146	.0117	.01440	.01083	1.02	1.08
Central Vermont	513	536	2,006	2,730	724	36.1	3.9	5.1	94.97	89.23	.063	.102	.0079	.0093	.00880	.00840	0.90	1.12
Maine Central	816	932	3,586	7,109	3,523	98.2	4.4	7.6	81.11	88.80	.163	.157	.0123	.0141	.01130	.00995	1.09	1.42
N. Y., N. H. & Hartford	2,008	2,044	13,116	34,184	21,068	160.6	6.5	16.7	85.36	93.77	.076	.174	.0097	.0182	.01451	.01420	0.67	1.29
Total	5,124	5,801	30,938	68,882	37,944	122.6	6.0	10.1	82.11	93.97	.107	.139	.0112	.0133	.01225	.01085	0.92	1.23
Trunk Line Roads.																		
Baltimore & Ohio	3,199	4,004	61,708	80,759	19,051	30.9	19.3	20.1	194.81	192.25	.128	.119	.0068	.0087	.00412	.00581	1.96	1.50
Buff., Roch. & Pitts. ...	472	568	8,858	15,199	6,341	71.6	18.7	26.8	136.16	155.40	.139	.238	.0097	.0122	.00470	.00482	1.99	2.53
Central of N. J.	639	610	15,002	20,181	5,179	34.5	23.4	33.1	77.88	75.28	.153	.164	.0118	.0102	.00871	.00839	1.36	1.22
Chesapeake & Ohio	1,476	1,897	17,270	34,182	16,912	97.9	21.6	18.0	302.00	275.00	.082	.122	.0058	.0067	.00343	.00410	1.71	1.64
Delaware & Hudson ...	665	843	13,030	21,152	8,122	62.3	19.6	25.0	94.46	134.20	.147	.144	.0113	.0088	.00789	.00670	1.54	1.33
Del., Lack. & Western ..	947	957	27,287	27,541	254	1.0	28.8	28.8	151.00	172.00	....	....	.0144	.0083	.00808	.00781	1.79	1.06
Erie Railroad	2,104	2,231	46,225	50,941	4,716	10.2	21.9	22.8	191.40	183.21	.101	.124	.0089	.0085	.00559	.00586	1.60	1.48
Lehigh Valley	1,382	1,441	34,954	41,970	7,016	20.1	25.3	29.1	188.08	167.71	.135	.145	.0106	.0092	.00542	.00639	1.97	1.49
N. Y. C. & Hud. River..	2,817	3,782	59,180	64,846	5,666	9.6	21.1	17.2	163.00	193.26	....	.083	.0088	.0066	.00560	.00631	1.72	1.19
Pennsylvania Railroad..	3,716	4,015	80,385	128.220	47,835	59.5	21.6	31.9	109.54	158.68	.091	.113	.0067	.0066	.00540	.00580	1.25	1.16
Phila. & Reading	1,000	997	31,824	42,204	10,380	32.6	31.8	42.3	89.42	94.23	.139	.154	.0114	0102	.00831	.00759	1.50	1.36
Western Maryland	279	543	691	6,444	5,753	832.5	2.5	11.9	51.02	108.24	....	.140	.0038	.0082	.00734	.00620	0.53	1.32
Total	18,696	21,888	396,414	533,639	137,225	34.6	21.2	24.4	145.73	159.12	.093	.141	.0092	.0087	.00622	.00632	1.56	1.44
Southern Classification.																		
Atlantic Coast Line....	1,759	4,476	5,378	24,255	18,877	351.0	3.6	5.4	121.90	142.09	....	.134	.0143	.0167	.01401	.01259	.1.02	1.32
Central of Georgia ...	1,196	1,916	5,041	10,269	5,228	103.7	4.2	5.4	148.86	151.14	.107	.152	.0183	.0123	.01096	.01079	1.26	1.38
Louisville & Nashville..	3,007	4,398	23,402	41,720	18,318	78.2	7.7	9.5	163.00	174.40	.096	.130	.0090	.0098	.00758	.00763	1.13	1.28
Mobile & Ohio	876	1,114	5,389	11,066	5,677	105.3	6.2	9.9	195.63	220.00	....	.113	.0076	.0096	.00590	.00621	1.33	1.55
Nash., Chat. & St. Louis	1,189	1,230	5,328	9,458	4,130	77.5	4.4	7.7	151.00	156.00	.113	.266	.0096	.0115	.00880	.00960	1.10	1.20
Norfolk & Western	1,551	1,903	18,656	35,529	16,873	90.4	12.0	18.6	253.41	268.19	.085	.111	.0068	.0066	.00430	.00460	1.58	1.43
Seab'd Air Line (1901)	2,604	2,603	8,335	13,966	5,631	67.5	3.2	5.4	153.32	154.41	.119	.136	.0136	.0138	.01180	.01129	1.14	1.23
Southern Railway	6,306	7,170	26,814	51,741	24,927	93.0	4.2	7.2	168.82	169.73	.107	.143	.0116	.0116	.00916	.00952	1.27	1.51
Total	18,488	24,810	98,343	198,004	99,661	101.3	5.3	8.6	169.49	179.49	.105	.148	.0114	.0115	.00906	.00903	1.23	1.36
Central Classification.																		
Chic., Ind. & Louisville	546	616	5,440	5,999	559	10.3	9.9	9.7	153.00	143.00	.155	.176	.0141	.0142	.00757	.00825	1.86	1.72
Cin., Ham. & Dayton ..	652	1,036	7,838	12,528	4,690	59.8	12.0	12.0	108.96	124.13	....	.190	.0122	.0125	.00610	.00529	2.00	2.28
C. C. C. & St. Louis ...	1,891	1,982	15,484	22,123	6,639	42.9	8.2	11.7	169.30	152.70	.094	.089	.0083	.0064	.00583	.00544	1.42	1.33
Grand Rapids & Indiana	582	587	3,015	3,226	211	7.0	5.2	5.5	90.12	104.95	.140	.095	.0156	.0072	.00870	.00666	1.88	1.08
Lake Erie & Western ..	725	886	5,549	4,237	‡1,312	23.6	7.6	4.8	153.51	123.54	.137	.096	.0110	.0069	.00614	.00686	1.89	1.07
Lake Shore & Mich. So.	1,411	1,663	19,958	34,231	14,273	71.5	14.1	20.6	178.00	163.00	.067	.082	.0055	.0057	.00505	.00518	1.09	1.15
Michigan Central	1,635	1,746	14,219	18,249	4,030	28.3	8.6	10.5	193.50	162.00	....	.072	.0070	.0060	.00592	.00626	1.19	1.00
N. Y., Chic. & St. Louis	513	523	6,743	11,716	4,973	73.7	13.1	22.4	297.00	205.00	.059	.087	.0055	.0071	.00478	.00516	1.16	1.42
Pennsylvania Company.	1,396	1,416	43,967	53,163	9,196	20.9	31.5	37.5	77.95	77.26	.177	.149	.0135	.0086	.00590	.00595	2.30	1.45
P. C. C. & St. Louis ...	1,407	1,469	12,884	23,008	10,124	78.6	9.1	15.7	111.14	117.39	.056	.077	.0052	.0060	.00620	.00641	0.84	0.93
Pere Marquette	1,821	2,285	7,944	19,641	11,697	147.2	4.3	8.6	112.64	180.44	....	.137	.0124	.0109	.00802	.00577	1.55	2.02
Vandalia	727	827	5,922	7,849	1,927	32.5	8.1	9.4	74.46	101.17	.121	.110	.0119	.0088	.00718	.00669	1.66	1.32
Total	13,306	15,036	148,963	215,970	67,007	44.9	11.2	14.4	143.63	137.88	.112	.113	.0102	.0084	.00645	.00649	1.57	1.39
Western Classification.																		
Atch., Top. & Santa Fe.	7,426	9,793	27,486	51,445	23,959	87.1	3.7	5.3	349.19	363.53	.073	.087	.0079	.0067	.00976	.01026	0.81	0.80
Chicago & Alton	855	998	9,386	12,067	2,681	28.5	10.9	12.1	176.16	151.28	.135	.117	.0148	.0082	.00794	.00570	1.87	1.58
Chic. & Eastern Illinois	711	966	8,206	18,925	10,719	130.6	11.5	19.6	144.70	159.41	.132	.199	.0096	.0108	.00483	.00480	1.99	2.36
Chicago & Northwestern	5,219	7,638	40,846	58,453	17,607	43.1	7.8	7.3	151.30	148.31	.108	.175	.0106	.0120	.00830	.00900	1.28	1.34
Chic. Burl. & Quincy ..	7,546	9,279	42,287	51,741	9,454	22.3	5.6	5.6	254.87	239.74	....	.093	.0111	.0066	.00851	.00790	1.29	0.98
*Chicago Gt. Western..	930	1,476	5,782	10,649	4,867	84.2	6.2	7.2	301.68	235.32	.087	.112	.0081	.0086	.00720	.00688	1.13	1.43
Chic., Mil. & St. Paul ..	6,423	7,297	35,740	43,692	7,952	22.2	5.6	6.0	189.07	183.69	.093	.091	.0106	.0074	.00929	.00838	1.14	1.03
Chic.. Rock Isl. & Pac.	3,647	8,026	17,150	37,448	20,298	118.3	4.7	4.7	213.00	212.76	.094	.098	.0096	.0079	.00990	.00940	1.08	0.96
Chic., St. P., M. & Om..	1,557	1,739	10,253	12,430	2,177	21.2	6.6	7.1	160.55	144.77	.149	.204	.0135	.0130	.00971	.00903	1.39	1.44
Colorado & Southern ..	762	1,980	2,979	8,649	5,670	190.3	3.9	4.4	101.00	138.00	.108	.114	.0115	.0077	.01242	.01067	0.93	0.82
Denver & Rio Grande ..	1,674	2,534	8,359	11,668	3,309	39.5	4.9	4.6	.....	108.38	.118	.126	.....	.0086	.....	.01310	1.09	0.76
Dul., So. Sh. & Atlantic.	585	594	2,697	2,804	107	3.9	4.6	4.7	49.07	67.23	....	....	.0209	.0163	.01221	.00951	1.70	1.72
Great Northern	5,418	6,878	21,484	42,280	20,796	96.7	3.9	6.1	192.00	267.55	.104	.129	.0085	.0074	.00899	.00810	0.93	1.07
Illinois Central	3,996	4,551	32,439	60,113	27,674	85.3	8.1	13.2	213.83	242.91	.092	.128	.0094	.0083	.00651	.00596	1.45	1.67
Iowa Central	510	558	2,238	3,418	1,180	52.7	4.4	6.1	152.30	162.71	.099	.130	.0084	.0085	.00696	.00616	1.21	1.45
Kansas City Southern..	833	827	5,118	6,908	1,790	35.0	6.1	8.3	304.41	261.29	.118	.110	.0091	.0071	.00613	.00749	1.49	1.04
Minn. & St. Louis	597	1,027	3,066	4,386	1,320	43.1	5.1	4.3	108.79	102.84	.196	.206	.0155	.0152	.01212	.01075	1.45	1.57
M., St.P. & S. Ste Marie	1,255	2,395	6,631	12,624	5,993	90.4	5.3	5.3	194.65	234.18	.129	.146	.0109	.0116	.00658	.00793	1.67	1.46
Missouri Pacific	4,938	6,489	25,186	39,044	13,858	55.0	5.1	6.0	236.24	214.13	.102	.113	.0095	.0083	.00834	.00704	1.15	1.18
Missouri, Kans. & Tex.	2,218	3,072	9,669	22,031	12,362	127.8	4.4	7.2	298.93	219.94	.073	.131	.0082	.0136	.00840	.01042	0.98	1.31
Northern Pacific	5,006	5,733	23,138	41,498	18,360	79.3	4.6	7.2	309.60	313.10	.105	.114	.0104	.0066	.00987	.00895	1.04	0.86
†St. Louis & San Fran..	1,659	5,251	5,974	26,677	20,703	346.5	3.6	5.1	182.05	150.29	.093	.125	.0114	.0090	.01058	.01010	1.08	1.04
St. Louis Southwestern	1,258	1,470	5,386	9,109	3,723	69.1	4.3	6.2	196.28	243.22	.127	.139	.0130	.0127	.01110	.01080	1.17	1.18
San An. & Aransas Pass	687	724	1,553	2,150	597	38.4	2.3	3.0	162.26	159.36	.113	.104	.0142	.0111	.01861	.01513	0.95	0.80
Southern Pacific	7,576	9,977	29,413	43,444	14,031	47.7	3.9	4.4	307.31	256.52	.096	.089	.0062	.0060	.00957	.01154	0.75	0.62
Texas & Pacific	1,570	1,885	6,263	10,917	4,654	74.3	3.9	5.8	231.77	185.00	.079	.103	.0093	.0108	.01030	.01030	0.91	1.07
Union Pacific	5,428	6,062	21,826	26,025	4,199	19.2	4.0	4.3	305.69	383.70	.080	.065	.0082	.0041	.01046	.00845	0.78	0.48
Wabash	2,340	2,515	13,087	22,910	9,823	75.0	5.6	9.1	216.70	219.11	.071	.088	.0068	.0073	.00558	.00582	1.23	1.33
Wisconsin Central	950	976	7,968	8,098	130	1.6	8.4	8.3	143.16	176.50	.202	.163	.0139	.0097	.00731	.00659	1.91	1.47
Total	83,574	112,710	431,610	701,603	269,993	62.6	5.1	6.2	208.81	204.99	.109	.125	.0107	.0090	.00919	.00883	1.23	1.20
Total all roads	**139,188**	**180,245**	**1,106,268**	**1,718,098**	**611,830**	**55.3**	**7.9**	**9.5**	**171.92**	**287.69**	**.106**	**.128**	**.0104**	**.0094**	**.00829**	**.00808**	**1.33**	**1.30**

†Before consolidation with other companies.
‡Decrease.
*Chicago Great Western figures for 1909 include proprietary lines. In 1900 the latter were not included. Figures not kept separate for 1909.

TONNAGE RATING FOR FAST FREIGHT TRAINS.

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I.

How many cars should a freight locomotive be required to haul? Formerly the demands of commerce led simply to the hauling of as many cars as were ready, but as growing demands approached the limit of capacity of the engine it became necessary that a definite amount be designated as a load for each engine. This amount it was found should be stated as not alone the number of cars but also the number of tons.

Many of the large trunk lines made a long series of tests for the more accurate determination of "tonnage rating," the work done by the Northern Pacific being notable. While large sums of money were expended to insure the accuracy of these experiments, it was not considered at the time unreasonable to reduce the amount, from ratings thus obtained, for the purpose of increasing the speed without making as careful a

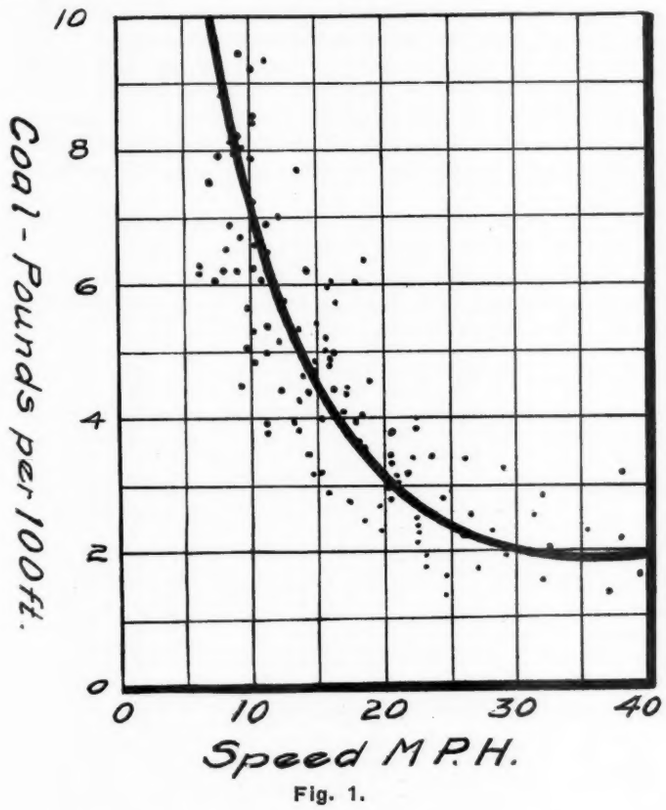


Fig. 1.

determination for the amount of this latter reduction. Furthermore, the "distribution of tonnage," or the proportion of the tons of cars to tons of freight, was not considered with the same consistent carefulness and reductions for this factor that was given to those for weather conditions. Tonnage rating historically has been a process of determining accurately the maximum load for the locomotives and then reducing this load more or less arbitrarily. There are, in fact, some lines in this country to-day still operating on the old car basis with arbitrary reductions which range between 10 and 50 per cent. of the regular load.

The time element, so neglected in the past, must be given due consideration. Unnecessary delays and other "lay overs" are all expensive to the railway, and should be eliminated whenever possible. Demands for increasing speed as well as changes in methods of despatching and controlling trains, have led to the discovery of a method whereby the tonnage of fast trains can be ascertained with the degree of accuracy that has characterized the tonnage rating of slower trains. The "personal equation" of the train crews immediately in charge of the train is taken into consideration when the tests made are in connection with trains in service. The fact that train despatching partakes of the nature of an art rather than a science has until lately deterred scientific effort in attempting a solution of the complicated problem. Business requires that traffic be handled rapidly and the railway management demands that it be handled economically. Some attempts have been made to determine the effect of variations of tonnage on speed, but the results were not sufficiently reliable because the methods involved "experimental psychology" with the train crews rather than a test of mechanical devices alone.

Since fareful analyses have been made of the operation of trains at different points on the profile for speed of trains, it is reasonable to assume that the time required for such operation may be determined in a similar manner. The relation of the speed of freight trains to their tonnage should, it appears, be of a more or less definite and determinative character. The amount of calculation necessary to work out a complete set of analyses would be enormous, but justifiable if the resulting economies were at least equal to the expenditure, not to mention the progress in the art of efficient operation which would be thus effected.

Almost all of the present despatching is based upon the judgment of men whose practical training has been the most reliable source of information available. Conditions of weather would hardly permit of scientific treatment, although attempts have been made to determine train resistances at different temperatures, some large trunk lines having adopted rules for tonnage reductions governed by changes in temperature. The Northern Pacific, for example, uses the following rules:

"Reduce rating 10 per cent. between 30 and 10 deg. above zero; 15 per cent. between 10 above and 10 below zero; 25 per cent. when the temperature is below 10 deg. below zero."

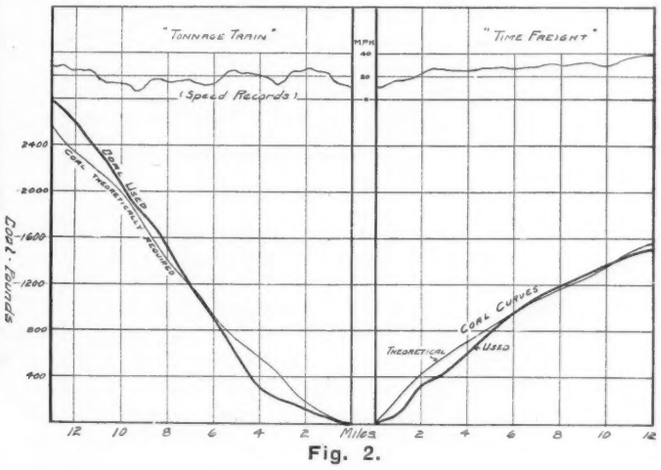


Fig. 2.

Similar rules govern reductions for speed and careful investigation showed that nearly all such rules are based upon the judgment of one or two of the operating officials, without the assistance of any technical information.

The requirements of railway management pressing continually for economies in operation, a demonstration that many of these reductions can be computed with a reasonable degree of accuracy should be entitled to some consideration. The judgment of operating officials can be materially assisted by the information which a scientific determination can offer; although it is admitted that many items cannot be exactly determined and all information obtained will be subject more or less to slight alterations for special conditions.

The president of a railway in the state of Wisconsin, becoming impressed with the necessity for something approaching a "scientific time-card," gave instructions to the chief engineer to proceed at once with the computations. Some investigation showed that this would involve a large amount of labor

in practically a new field, requiring pioneer work in calculations, as well as special testing, it appearing that no previous attempt had been made to do such work. Owing to pressing matters in connection with construction and maintenance the entire force in the engineering department was busy and for these and other reasons it became necessary to secure assistance from the outside. The Railway Department of the University of Wisconsin undertook and successfully carried through the solution of the problem, part of the results of its work being given in this article.

Fortunately a large number of tests of a commendable nature had been made previously, and these furnished valuable data for some of the factors involved in the computations. A number of service tests were also made in order to determine the difference between the maximum possible operating ability of the engine and a reasonable "service value" which might be expected in the regular operation. These tests were successful and revealed, among other important facts, the practice of some train crews to disregard the opportunities for making faster time when it was possible and desirable. The computations were made for the principal classes of locomotives in use, with trains varying from 400 tons to the maximum capacity of the engines. In the tests the tonnage was adjusted to efficiently operate the time-card then in effect, with

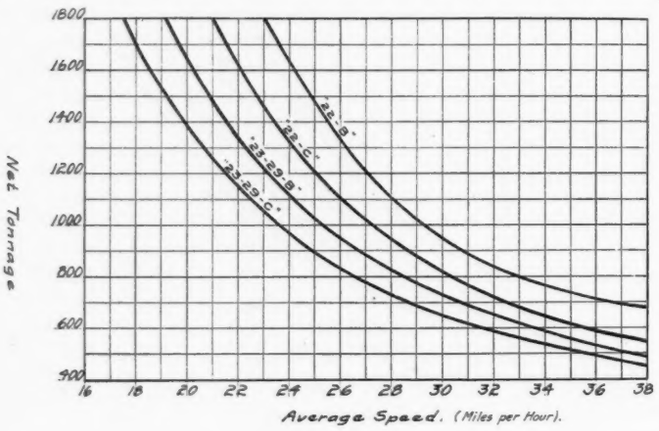


Fig. 3.

the object of testing out the method by which it was proposed to make out a "scientific time-card" adjusted to suit the tonnage requirements.

Some gratifying results were obtained. Trains which had been invariably late were found to have been so heavily loaded that the schedule time expected was clearly a physical impossibility. Under the new rating there was no complaint, and the time was regularly sufficient. Other trains which had been occasionally late and of which complaints had been often made that, "the rating was too high," were given a higher tonnage in a new rating and have been operating since on time and without complaint. In general, under the new rating there was a slight increase in the total tonnage hauled, and the adjustments have increased the fast freight capacity in most cases. After two years of operation under the adjusted tonnage rating the superintendent of transportation stated that, "there has been a decided improvement both in maintaining the schedule time and in holding up the tonnage without complaint." It was decided that unquestionably the merits of this new system more than compensated for the expense of its computation. There can be no reasonable doubt that the experiment has proven a success and the methods were followed in the application to other divisions with the intention of making a complete rating booklet for the entire system.

DESPATCHER'S TABLES.

The efficient despatching of freight trains with variable tonnage depends upon a definite determination of "speed rating." It is a comparatively simple matter to efficiently handle through trains with practically constant tonnage, but difficulties are encouraged when these trains are changing their loads by large amounts. Traffic has frequently been delayed because of the stalling of freight trains on steep grades, which grades they could have overcome had they not been required to stop at some point near the beginning. The despatcher, lacking definite information on this point, could only ascertain the facts by experimenting, the trying of experiments of this kind proving expensive. Through the application of the new method referred to it becomes possible to prepare despatcher's tables which indicate the time required for any train to pass from any given point on the road to any other given point, and also to indicate what are the maximum loads which the locomotives can handle at any point without stalling.

The arrangement of the data found in the "speed-rating" computations formed the basis for the preparation of the despatcher's tables, part of a typical page being shown in Table I. The manner of using this information is as follows:

Engine numbers will be found in the upper left hand corner of each page with the corresponding tonnage of the train (in hundreds of tons) on the same line to the right, below which are the numbers of minutes required to haul that tonnage between the stations named in the left hand margin.

Example: Engine number 244 with 1,484 tons from Nelsons to Stevens Point (see Table I) requires 45 minutes. If stopped at Custer would require 30 minutes; from Custer to Stevens Point (see next to bottom line) requires 18 minutes, or a total of 48 minutes, to which must be added the length of the stop.

Blank spaces indicate the safe limit of tonnage at that point. When "H" appears it indicates that a helper engine is needed. All engines in a group have rating within the hundred tons given. The tonnage line is to be taken which is nearest the tonnage of the train.

Table 1.—Despatcher's Tables—*Waupaca to Stevens Point.*
Northbound. Second Division.

Engine Nos.		Gross tonnage, hundreds of tons.												
108–128, 211–220, 257–266.		5			6			7			8			9
221–226, 227–230, 231–241.			5			6			7			8		9
160–176, 242–246, 247–256.				5			6			7			8	
From	To	Time, in minutes												
Waupaca	Sheridan	20	17	14	23	19	17	25	20	19	27	22	20	28
	Nelsons	31	26	25	36	29	27	39	32	29	41	34	31	43
Sheridan	Nelsons	14	12	11	15	13	12	16	14	13	18	15	14	19
Nelsons	Amherst	4	4	4	5	4	4	5	4	4	5	5	5	6
	Amherst Jctn	8	8	7	10	9	8	11	9	9	12	10	9	13
	Lake Emily	13	11	10	14	12	11	15	13	12	17	14	13	18
	Custer	22	19	18	24	21	19	26	23	20	28	24	22	30
	Stockton	26	24	22	28	26	23	30	27	24	33	29	26	35
	Stevens Point	34	31	30	37	33	31	40	35	33	43	37	35	45
Amherst	Amherst Jctn	7	6	5	8	7	6	8	7	7	8	8	7	9
	Lake Emily	11	9	9	12	10	10	13	11	10	15	12	11	17
	Custer	20	17	16	22	19	17	24	20	18	26	22	20	28
	Stockton	25	21	20	27	23	21	29	25	23	30	26	24	34
	Stevens Point	34	30	28	36	32	30	39	34	32	42	36	33	44
Amhrst J.	Lake Emily	6	5	5	7	6	5	7	6	6	8	7	6	9
	Custer	14	13	12	16	14	13	18	15	14	19	16	15	20
	Stockton	19	17	13	22	18	16	24	19	18	25	21	19	26
	Stevens Point	28	25	21	31	27	24	33	28	27	35	30	28	36
Lk Emily.	Custer	10	9	9	11	10	9	12	11	10	13	11	10	13
	Stockton	15	13	12	16	15	13	17	16	14	18	17	14	19
	Stevens Point	24	21	19	25	23	21	27	24	23	28	25	24	29
Custer	Stockton	6	5	5	6	5	6	6	6	6	7	6	6	7
	Stevens Point	15	13	13	15	14	14	16	15	15	17	15	15	18
Stockton	Stevens Point	11	10	9	12	11	10	12	11	11	13	12	11	13

Besides the large table arranged as above described for use between any two individual stations a set of ratings were made for through schedules, and this was arranged as follows:

W. C. Ry.—Through Tonnage Rating on Second District.

Effective Oct. 15, 1907.

Locomotive Nos.	Tonnage of trains.		Time freight tonnage. Train numbers					
	North.	South.	No. 21.	No. 22.	No. 23.	No. 24.	No. 27.	No. 28.
108—128	1,069	1,443	969	1,141	954	1,258	669	873
211—220	1,090	1,474	977	1,172	962	1,282	684	882
257—266	1,130	1,535	983	1,204	963	1,334	698	899
227—230	1,329	1,795	1,094	1,377	1,076	1,517	831	1,047
221—226 } 231—241 }	1,466	1,976	1,202	1,542	1,182	1,687	932	1,157
160—176	1,615	2,179	1,456	1,865	1,421	1,877	1,061	1,349
247—256	1,622	2,183	1,458	1,855	1,398	1,875	1,058	1,345
242—246	1,636	2,196	1,471	1,867	1,411	1,887	1,071	1,357

For empties, deduct one-fifth from the above rating.

Example: What is the rating for Train No. 28 with Engine No. 248, all empties?

From above table rating for loads is found in the last column next to the bottom line to be	1,345 tons.
Deduct one-fifth	269
Balance empties	1,076 tons.

Again: Train No. 22, Engine No. 172 has 915 tons of load. How many tons of empties will fill out the rating?

	Tons	
From the table the rating for loads is	1,865	
Load on	915	915
Balance	950	
Deduct one-fifth.	190	
Balance empties.	760	760
Total tonnage is		1,675

With this material the despatcher can make his adjustments for time with full information as to the effect upon any of the parts or the entire length of the trip. The manner of taking care of the empties, unique in its simplicity and practicability, is based upon the "20 per cent." distribution allowance which was above justified. This method has been found to be satisfactory and has the advantage over "distribution tables" that it is more exact and more easily used. Any trainman can understand its workings and it is so simple

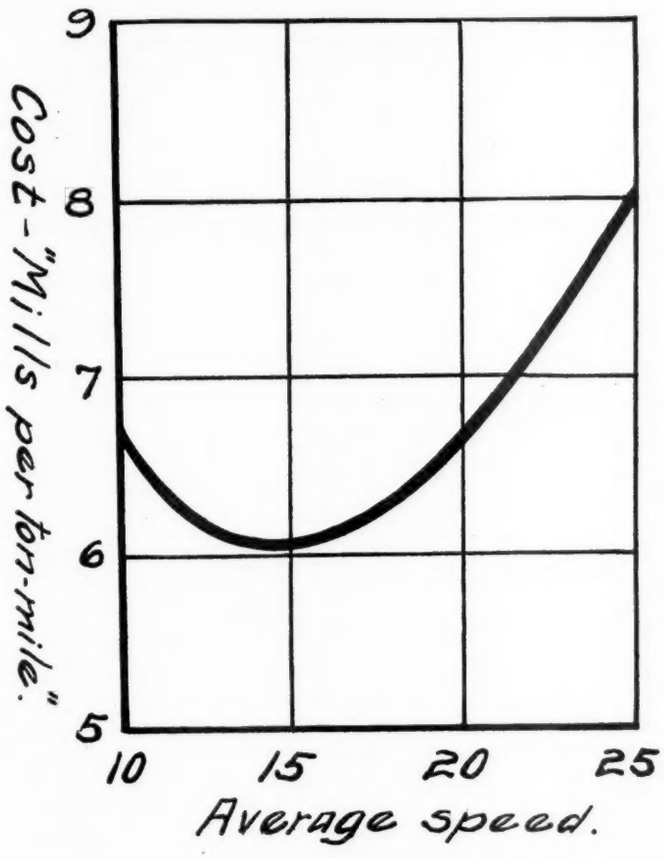


Fig. 4.

that after it has been used a few times the adjustment for empties can be made mentally.

It will be noted that the "time freight" ratings are given in a separate column for each schedule. The advantage of definiteness in this respect has been evidenced in the stopping of all complaints regarding reductions for speed.

The effect of having grade crossings without interlocking plants is easily traced in the large table. It can be shown that an instantaneous stop of freight train of average size will require an average increase in time over the run of about three minutes. Ten crossings requiring such stops would add about half an hour to a run, and in a year's time would make quite a difference in the total time lost from slowing up and accelerating at these points.

There are probably many other practical uses for such data as is here given in Table I, and it appears that what has been done would justify a more extensive application of the method.

A METHOD OF ADJUSTING TONNAGE RATING FOR PARTIALLY LOADED CARS AND EMPTIES.

Derivation of Formulae—

Let A = Tons on train.

B = Number cars on train.

C = Rating to be filled out in train.

X = Equivalent number of loads, at 45 tons average.

Y = Equivalent number of empties, at 15 tons average.

$45X + 15Y = "A"$ Combining; $X = \dfrac{A - 15B}{30}$ = Number of "loads" on train.

$X + Y = "B"$

$Y = B - X$ = Number equivalent "empties" on train.

Deduction (assuming 20 per cent. for empties):

(1)—$\dfrac{(C - 45X)\ .80}{15}$ = Number of "empties" to fill out rating.

(2)—$\dfrac{C - 45X}{45}$ = Number of "loads" to fill out rating.

Now if "partially loaded cars" are to be added—

The per cent. of "equivalent empties" $= 45 - \dfrac{(\text{Average weight of all cars})}{30}$

Average weight of cars in train or to be put on train is a measure of the per cent. of "equivalent empties," in a corresponding train of loads and empties only.

TABLE 2.

Av. weight.	Per cent. "Equiv. empties."	Per cent. Rating is reduced.	Av. weight.	Per cent. "Equiv. empties."	Per cent. Rating is reduced.
45 tons.	....	....	29 tons.	53.3	10.7
44 "	3.3	0.7	28 "	56.4	11.3
43 "	6.7	1.3	27 "	60.0	12.0
42 "	10.0	2.0	26 "	63.0	12.7
41 "	13.3	2.7	25 "	66.7	13.3
40 "	16.7	3.3	24 "	70.0	14.0
39 "	20.0	4.0	23 "	73.3	14.7
38 "	23.3	4.7	22 "	76.7	15.3
37 "	26.7	5.3	21 "	80.0	16.0
36 "	30.0	6.0	20 "	83.3	16.7
35 "	33.3	6.7	19 "	86.7	17.3
34 "	36.7	7.3	18 "	90.0	18.0
33 "	40.0	8.0	17 "	93.3	18.7
32 "	43.3	8.7	16 "	96.7	19.3
31 "	46.7	9.3	15 "	100.0	20.0
30 "	50.0	10.0			

RULE.

(1) Divide tonnage on train by number of cars.

(2) Increase tonnage on train by per cent. in column 3 (Table II, that is, multiply tonnage (on train) by that per cent. and add result to tonnage on the train).

(3) Subtract result thus obtained from tonnage rating and reduce that by same per cent. if cars to be added have same average weight, *or if not, by the correct per cent. for them.*

(4) This result is tonnage to be added.

EXAMPLE.

Given: "A" = 1,000 tons "B" = 25 cars; now on train.
"C" = 1,540 rating for division.

Reg'd: How many more cars at average weight, 37 tons, can be taken?

(1) $\dfrac{1000}{25}$ = 40 tons average in train, or 16.7 per cent. equivalent empties (Column 2, Table II).

(2) 1000 + (3.3 per cent. 1000) = 1000 + 33 = 1033 tons. (Column 3, Table II.)

(3) 1540 — 1033 = 507 tons balance, to be reduced 5.3 per cent. (Column 3, at 37 tons ave. wt.)

5.3 x 507 = 26.9 tons or deduct 27 tons.

507 — 27 = 480.

(4) 480 tons or $\dfrac{480}{37}$ = 13 *more cars. Ans.*

ECONOMY IN FASTER FREIGHT TRAIN OPERATION.

Nearly all of the railways in this country have for some time past been operating on the principle that it is not economical to operate a freight train at the minimum speed, or, in other words, with the maximum load. This minimum speed has generally been placed at an average between terminals of 10 miles per hour. In fact, the wages of train crews have been for many years computed on this basis, irrespective of the actual speed of the train. It is reasonable to believe that there are factors which increase the unit cost of train operation at low speeds, in larger proportion than the benefits derived by increased tonnage, tend to decrease that unit cost. As an indication of the trend of judgment of railway managers, it is interesting to note that on several of the large roads there is a conviction that it is not economy to "overload" the locomotives, and it has been observed that a speed of about 15 miles per hour is more economical than a speed of 10 miles per hour. The computations demonstrated that there are economies in fast freight operation. During the study it has been interesting to observe that many of the determinations have supported the apprehensions of some operating officials upon points of economy which previously they had hardly dared voice.

The net result of the study has been the proving that "speed rating" is subject to more or less definite determination, and this important factor in rate making need no longer be so largely an approximation. Since it has been successfully demonstrated there is little reason to doubt that in the future the operation of a railway may be as scientifically conducted as the operation of any other industrial enterprise.

COMPARISON OF THE COST OF OPERATION OF "TIME FREIGHT" AND "TONNAGE" TRAINS.

The following is an outline of the steps involved in the solution of this problem:

(1) Actual road tests on the division.

(2) Accumulation of theoretical data and checking same by actual tests.

(3) Determination of the relation between coal and water consumption and speed.

(4) Determination of the relation between tonnage and speed.

(5) Determination of the cost of operation at the various speeds.

Locomotive tests are not always representative of actual conditions and have been generally run on engines just out of the shops, with a special test train and schedule. The results so obtained do not indicate service conditions, so, in the investigation tests were made on service trains which were representative of actual service conditions.

The amount of coal used per 1,000 ton-miles and the pounds of water evaporated per pound of coal agreed closely with the results obtained in tests made by Mr. Garstang on the Cleveland, Cincinnati, Chicago & St. Louis, and published in the proceedings of the Western Railway Club, 1901.

The relation between the coal consumed in the firebox and the speed of the train was determined in the following manner:

(1) An investigation into the waste of steam on account of radiation, safety valve, etc.

(2) A determination of the volume of steam required for operation under ordinary conditions, based upon indicator card tests.

(3) A computation of the quantity of coal necessary to produce the volume of steam required at various speeds.

It is evident that this determination gives a theoretical coal consumption based upon indicator card tests. Checks with the actual road tests and averages of coal consumed, from the reports of the chief engineer, show that it is not far from that found in actual practice. From the reports of the chief engineer, indicator card tests were available, by the use of which the volume of steam required at different speeds could be determined. For amount of coal required to evaporate the water used, the work of Professor Goss and Mr. Garstang at Purdue University was taken, the average being about 6 lbs. of water per pound of coal. Results were plotted (Fig. 1) and show clearly how coal consumption varies with the speed, the greatest economy being attained at the speed of about 33 miles per hour. A point of special interest in this curve is that it shows the consumption of coal of the different classes of locomotives to vary in the same way, the points being intermingled along the curve, which was checked by road tests. The first check was made by selecting those parts of the speed records in which tonnages were somewhat uniform for all the tests and plotting below them the curve of actual coal consumption per mile, this being shown in Fig. 2. This gives a check which is remarkable and shows that theoretical deductions and actual conditions were not far apart.

In order that a fair comparison could be made of the costs of operation at various speeds, the cost was considered on the "ton-mile" basis, and to do this the necessary relation was determined between the tons hauled and the average speed, by plotting a curve of arbitrary stops from the despatcher's records. It was simply necessary to add the stopping time at a given tonnage to the running time previously found to be necessary for that period with the same tonnage, and divide the sum by the total miles. In Fig. 3 curves are plotted showing the variation at average running speeds.

As before stated, the comparison of operating costs was made on a ton-mile basis, and in view of this fact, the costs in this determination were figured on a unit of 1,000 ton-miles, only those items being considered which would be likely to vary with tons hauled and the speed, a summary of the results being given in Table III. The cost of coal on this division was $2.10 per ton (average) and the cost of water was assumed at 10 cents per 1,000 gallons, as given by Henderson, although it was perhaps high for this road, on which, however, no actual data was obtainable. The costs of locomotive and car repairs were taken from Henderson's determinations as being 15 cents per 1,000 ton-miles. The pay of engineers and firemen is based on a schedule of 100 miles or less, or 10 hours or less per day. The interest allowance was also accepted as figured by Henderson and amounted to $2.50 per day, or practically 10 cents per hour. In line 15 the sum of the different columns is shown and represents the comparative costs of operating, per 1,000 ton-miles. Fig. 4 shows the economical speed for freight trains on this division is somewhere near 15 miles per hour. The curve also shows clearly how the cost increases both at the slower and at the faster speeds.

TABLE 3.—SUMMARY—*Table of Costs.*

1. Average speed between terminals....	10	15	20	25
2. Weight of train, back of tender.....	1,620	1,550	1,070	700
3. Actual time, hours between terminals	14.47	9.65	7.25	5.80
4. Coal burned, lbs. per mile.....	375	238	168	125
5. Coal burned, lbs. per 1,000-ton miles.	231	153.5	157	179
6. Water used, gallons per mile.....	215.5	154	104	85
7. Water used, galls. per 1,000-ton miles	133	99.5	97	121
Cost per 1,000-ton Miles.				
8. Cost of coal burned	.243	.161	.165	.188
9. Cost of water used.....	.0133	.0099	.0097	.0121
10. Cost of repairs	.145	.159	.168	.196
11. Pay of enginemen	.047	.050	.072	.111
12. Interest allowance	.0107	.0103	.0117	.0145
13. Cost of car repairs	.150	.150	.150	.150
14. Pay of trainmen	.0567	.0593	.0860	.1310
15. Total cost	.6657	.5995	.6624	.8026

The results in this table do not, it must be remembered, represent the total operating charge per 1,000 ton-miles, which would probably be a great deal more. The results are of interest in view of the fact that at the time most of the trains were made up on this division on the basis of an average speed of 10 miles per hour, whereas it appears from these computations that an average speed of 15 miles per hour would result in a decided saving.

[In an article in a later issue of the *Railway Age Gazette* Professor Van Zandt will explain the computations in detail and will present other data on which the despatcher's tables in the foregoing article were based.—EDITOR.]

BLOCK SIGNALS IN THE UNITED STATES, JANUARY 1.

The mileage of railways block signaled on January 1 last, as reported by the Interstate Commerce Commission, was given in a table published in the *Railway Age Gazette* of June 3, page 1339. The supplementary tables accompanying this government statement, in which are shown the kinds of automatic signals in use, and the methods and practices em-

TABLE 2.—THE BLOCK SYSTEM ON AMERICAN RAILWAYS—KINDS OF AUTOMATIC SIGNALS.

Names of railroads.	Exposed disk.		Inclosed disk.		Semaphores.						Normal clear, miles of track.	Normal danger, miles of track.	Total automatic signals.		
					Electro-pneumatic.		Electric motor.		Electro-gas.						
	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.			Miles of road.	Miles of track.	Number of block sections.
Atchison, Topeka & Santa Fe:															
Eastern lines			13.3	26.6			36.6	68.7			95.3		49.9	95.3	46
Western lines							35.8	38.2			38.2		35.8	38.2	36
Coast lines			6.4	7.4			7.5	7.5			14.9		13.9	14.9	12
Gulf, Colorado & Santa Fe			8.3	8.3			2.5	2.5			10.8		10.8	10.8	8
Atlantic Coast Line							2.2	4.4			4.4		2.2	4.4	6
Baltimore & Ohio			10.9	11.9	4.6	16.6	80.2	156.8	93.6	186.2	8.2	363.3	189.3	371.5	412
Boston & Maine			8.5	17.5			526.0	1,051.6	8.9	17.8	1,053.1	33.8	543.4	1,086.9	1,353
Boston, Revere Beach & Lynn							13.8	27.6			27.6		13.8	27.6	59
Butte, Anaconda & Pacific			7.9	7.9							7.9		7.9	7.9	7
Central of New Jersey					29.7	116.0	163.3	323.2	19.4	38.0	439.2	38.0	212.4	477.2	751
Chesapeake & Ohio							48.1	96.2			96.2		48.1	96.2	57
Chicago & Alton							561.0	705.9			183.0	522.9	561.0	705.9	368
Chicago & Eastern Illinois [a]			8.7	13.8			98.4	196.8			210.6		107.1	210.6	165
Chicago & Northwestern			715.6	1,449.1	6.3	12.6					1,461.7		721.9	1,461.7	1,140
Chicago & Western Indiana							17.8	35.6			35.6		17.8	35.6	59
Chicago, Burlington & Quincy			23.0	46.0	5.0	20.0					66.0		28.0	66.0	67
Chicago Great Western							8.1	16.0			16.0		8.1	16.0	21
Chicago, Milwaukee & St. Paul			2.4	2.4			42.6	85.2	3.5	3.5	75.2	15.9	48.5	91.1	102
Chicago, Peoria & St. Louis Railway of Illinois							1.2	1.2			1.2		1.2	1.2	1
Chicago, Rock Island & Pacific			8.0	14.0			591.5	865.1			879.1		599.5	879.1	809
Chicago, St. Paul, Minneapolis & Omaha							6.4	12.8			12.8		6.4	12.8	6
Chicago Terminal Transfer			1.0	2.0			5.2	9.6			11.6		6.2	11.6	12
Cumberland Valley							6.7	13.4			13.4		6.7	13.4	13
Cincinnati, Hamilton & Dayton							7.5	15.0			15.0		7.5	15.0	16
Delaware & Hudson			37.8	75.6					369.8	615.3		690.9	407.6	690.9	983
Delaware, Lackawanna & Western			25.6	51.2			506.6	967.3			1,018.5		532.2	1,018.5	1,427
Elgin, Joliet & Eastern							4.0	7.0			7.0		4.0	7.0	4
Erie							75.6	178.4				178.4	75.6	178.4	230
Erie & Jersey							42.3	84.6			84.6		42.3	84.6	88
New Jersey & New York							10.5	21.0				21.0	10.5	21.0	22
Grand Trunk					2.7	4.3					4.3		2.7	4.3	3
Great Northern							70.2	132.2			128.0	4.2	70.2	132.2	138
Illinois Central			27.7	104.1			133.1	253.6	114.9	227.8	186.9	398.6	275.7	585.5	477
Yazoo & Mississippi Valley							6.6	6.6			6.6		6.6	6.6	8
Kanawha & Michigan							.8	.8			.8		.8	.8	1
Lehigh Valley			260.1	544.7			206.5	431.1	14.4	28.8		1,004.6	481.0	1,004.6	1,066
Long Island							91.7	190.1			186.1	4.0	91.7	190.1	279
Louisville & Nashville							52.2	71.5			71.5		52.2	71.5	112
Lehigh & New England							.7	.7			.7		.7	.7	1
Maine Central							319.8	365.5			365.5		319.8	365.5	402
Missouri, Kansas & Texas			.5	.5			2.5	2.5			3.0		3.0	3.0	5
Missouri Pacific							60.7	77.9			77.9		60.7	77.9	53
St. Louis, Iron Mountain & Southern							92.9	101.5			101.5		92.9	101.5	66
Mobile & Ohio							4.7	9.5			9.5		4.7	9.5	3
Monongahela							.5	.5			.5		.5	.5	1
New York & Long Branch							38.0	76.0			76.0		38.0	76.0	98
New York Central Lines:															
Boston & Albany [b]	18.6	83.8		.8			116.0	331.4	2.2	14.4	209.8	220.6	193.5	430.4	581
Chicago, Indiana & Southern							5.0	10.0			10.0		5.0	10.0	24
Lake Shore & Michigan Southern			5.3	5.3			335.7	815.7	179.4	626.7	816.5	631.1	520.4	1,447.6	1,407
Michigan Central [c]			71.9	143.7			190.8	381.7			525.4		262.7	525.4	337
New York Central & Hudson River [d]			11.2	22.4			187.5	483.0	8.1	16.2	267.0	254.5	206.8	521.6	777
Pittsburgh & Lake Erie							148.8	377.3			377.3		148.8	377.3	207
New York, New Haven & Hartford	170.9	322.9	64.7	129.4			20.7	39.8			492.1		256.3	492.1	512
New York, Ontario & Western	71.2	121.1					74.5	134.3			255.4		145.7	255.4	144
Norfolk & Western					.7	.7	137.6	271.8			271.8	.7	138.3	272.5	280
Northern Pacific			2.6	4.5			52.8	104.8	3.8	3.8	113.1		59.2	113.1	111
Northwestern Pacific							13.9	25.4			25.4		13.9	25.4	42
Pennsylvania			5.0	10.0	230.4	838.6	11.4	22.8			871.4		246.8	871.4	1,401
Pennsylvania Co.							240.7	590.8			590.8		240.7	590.8	800
Philadelphia, Baltimore & Washington					36.6	115.2					115.2		36.6	115.2	142
Pittsburgh, Cincinnati, Chicago & St. Louis							9.3	22.8			22.8		9.3	22.8	54
West Jersey & Seashore					94.0	194.3					194.3		94.0	194.3	249
Pere Marquette			2.0	2.0			10.9	10.9			12.9		12.9	12.9	9
Philadelphia & Reading [e]			348.6	762.3	1.0	2.0			14.0	20.1	2.0	782.4	363.6	784.4	918
Atlantic City			86.9	173.8								173.8	86.9	173.8	91
Northeast Pennsylvania			4.7	6.5								6.5	4.7	6.5	8
Philadelphia, Newton & New York			7.5	12.4								12.4	7.5	12.4	15
Queen & Crescent Route:															
Alabama Great Southern	29.4	29.8	9.0	9.0			53.7	53.7			92.5		92.1	92.5	61
Cincinnati, New Orleans & Texas Pacific	38.2	38.7	56.3	57.7			235.6	300.6	5.0	8.0	361.9	43.1	335.1	405.0	332
St. Louis & San Francisco			8.0	11.0			163.3	193.0			197.0	7.0	171.3	204.0	307
St. Louis Merchant's Bridge Terminal							5.9	11.8			11.8		5.9	11.8	30
St. Louis Southwestern							.4	.4			.4		.4	.4	1
San Pedro, Los Angeles & Salt Lake			1.1	1.1							1.1		1.1	1.1	1
Southern							3.0	6.0			6.0		3.0	6.0	9
Southern Illinois & Missouri Bridge							4.6	9.2			9.2		4.6	9.2	18
Southern Pacific, Atlantic System:															
Galveston, Harrisburg & San Antonio							215.3	215.3			215.3		215.3	215.3	163
Louisiana Western							103.6	103.6			103.6		103.6	103.6	73
Morgan's Louisiana & Texas							95.3	95.3			95.3		95.3	95.3	72
Texas & New Orleans							109.8	109.8			109.8		109.8	109.8	77
Southern Pacific, Pacific System			1.0	1.0	6.0	14.0	2,068.2	2,198.3			2,213.3		2,075.2	2,213.3	1,852
Staten Island Rapid Transit			10.0	20.0							20.0		10.0	20.0	49
Terminal Railroad Association of St. Louis							6.0	12.0			12.0		6.0	12.0	16
Ulster & Delaware							24.4	24.4			24.4		24.4	24.4	20
Union			0.6	1.2							1.2		.6	1.2	2
Union Pacific			8.7	15.1			1,260.2	1,682.7	38.6	72.0	1,769.8		1,307.5	1,769.8	1,361
Oregon Railroad & Navigation Co.							415.7	415.7			415.7		415.7	415.7	271
Oregon Short Line			24.0	24.0			350.2	357.1			381.1		374.2	381.1	512
Wabash							7.2	14.4			14.4		7.2	14.4	25
Wabash Pittsburg Terminal							4.1	8.2			8.2		4.1	8.2	11
Washington Terminal					2.1	20.4						20.4	2.1	20.4	13
Total	328.3	596.3	1,894.8	3,796.2	419.1	1,354.7	10,664.4	16,145.6	875.6	1,878.6	18,343.1	5,428.5	14,238.9	23,771.3	24,380

[a] (Chicago & Eastern Illinois.) Includes 8.7 miles inclosed disk not shown in Table 1, the same being covered by manual signals.
[b] (Boston & Albany.) 13.4 miles of road, 47.3 miles of track, covered by slotted signals not shown in this table; the total mileage includes 56.7 miles of road which are not classified.
[c] (Michigan Central.) 9.2 miles double track slotted signals not shown in this table.
[d] (New York Central & Hudson River Railroad.) 2 miles 4-track road on which light signals are used not shown in this table.
[e] (Philadelphia & Reading.) Includes 16.1 miles not shown in Table 1, used exclusively for freight traffic.

TABLE 3.—THE BLOCK SYSTEM ON AMERICAN RAILWAYS—METHODS AND APPARATUS, MANUAL SYSTEM.

Names of railroads.	Telegraph.		Telephone.		Electric bells.		Controlled manual.						Electric train staff.		Block signal stations.	
							No track circuit.		Track circuit at stations.		Continuous track circuit.					
	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Total number.	Number closed part time.
Atchison, Topeka & Santa Fe:																
Eastern lines			870.0	1,323.4									7.7	7.7	176	53
Western lines			559.9	561.1									28.5	28.5	104	17
Coast lines													4.3	4.3	4	
Gulf, Colorado & Santa Fe													2.1	2.1	2	
Atlanta & West Point							87.0	93.0							14	2
Atlantic Coast Line	352.5	414.5	135.3	166.1											119	19
Baltimore & Ohio	999.4	1,814.6	2.6	2.6							1.5	1.5			278	2
Baltimore & Ohio Southwestern	973.8	1,029.7													178	115
Baltimore & Sparrows Point	3.0	6.0													3	2
Bessemer & Lake Erie	194.2	298.7											.9	.9	53	9
Boston & Maine									4.8	9.6					2	
Buffalo, Rochester & Pittsburg	422.0	546.2													95	46
Chicago, Indianapolis & Louisville	537.7	537.7													55	51
Caldwell & Northern	2.4	2.4													2	2
Central of Georgia	59.7	66.1													19	3
Central Vermont							.4	.4			1.1	1.1			2	
Chesapeake & Ohio	1,188.6	1,357.6					147.4	147.4	92.1	184.2	28.9	37.7	7.7	8.8	369	79
Coal River			69.3	69.3											13	13
Chicago & Alton							122.7	122.7					18.5	18.5	25	4
Chicago & Eastern Illinois	151.0	207.2	8.9	10.2			61.4	61.4							52	15
Chicago & Northwestern	2,018.7	2,029.5	512.1	616.6											424	236
Chicago & Western Indiana					9.5	22.2									19	
Chicago, Burlington & Quincy	4,956.7	4,956.7	2,460.1	3,004.7			1,201.5	1,201.5			56.9	56.9			1,128	753
Chicago Great Western	288.9	815.7									.5	.5	1.6	1.6	78	21
Chicago, Milwaukee & St. Paul	3,862.6	4,248.0									1.0	1.0	8.5	8.5	646	262
Chicago, Milwaukee & Puget Sound	1,073.3	1,073.3											2.7	2.7	91	
Chicago, Rock Island & Pacific	657.5	657.5	485.3	485.3									9.0	9.0	175	88
Chicago, St. Paul, Minneapolis & Omaha	269.8	269.8	379.8	443.9											118	57
Cincinnati, Hamilton & Dayton	51.6	72.0													18	5
Cincinnati, Indianapolis & Western	41.8	41.8													8	2
Colorado Midland													2.0	2.0	2	
Cornwall & Lebanon	22.0	35.7													7	7
Cumberland & Pennsylvania	7.3	13.3													9	3
Cumberland Valley	17.6	17.6					2.0	2.0							12	
Davenport, Rock Island & Northwestern							41.7	42.8							11	6
Delaware & Hudson			.6	.6											2	
Delaware, Lackawanna & Western											1.5	1.5	4.3	4.3	4	
Duluth & Iron Range			16.8	18.8											8	6
Duluth, South Shore & Atlantic													4.2	4.2	2	
Durham & Southern	56.0	56.0													11	9
Elgin, Joliet & Eastern	9.2	9.2													1	
Erie	285.6	421.1	40.6	53.7	898.8	1,331.7									355	74
Chicago & Erie	248.8	257.2													60	8
Columbus & Erie	22.4	32.2													3	3
New Jersey & New York	26.1	26.1													11	5
New York, Susquehanna & Western and Wilkes-Barre & Eastern					20.7	20.7									17	2
Great Northern	174.8	174.8					65.0	65.0					19.9	19.9	59	3
Hocking Valley	74.7	74.7													24	
Illinois Central							5.0	10.0							2	
Kanawha & Michigan							1.3	1.3							2	
Kansas City, Clinton & Springfield			2.5	2.5											2	
Kentucky & Indiana Bridge and Railroad Co	9.7	14.6													7	
Lackawanna & Wyoming Valley			1.2	2.4									2.2	3.4	3	2
Lehigh Valley	729.4	789.9											6.2	6.2	156	108
Long Island					14.1	28.2			8.6	17.2					37	10
Louisville & Nashville	216.3	265.2													67	10
Marquette & Southeastern	3.7	3.7													2	
Minneapolis, St. Paul & Sault Ste. Marie	2,161.3	2,165.7	24.4	24.4											246	183
Missouri, Kansas & Texas	8.6	8.6													3	1
Missouri Pacific	15.8	15.8	7.0	14.0			1.9	1.9			1.2	1.2	8.2	8.2	12	3
St. Louis, Iron Mountain & Southern	4.6	4.6	1.0	1.0					1.1	2.2	1.2	1.2			7	
Mobile & Ohio	42.4	42.4													15	2
Mississippi Central	150.0	150.0													15	15
Nashville, Chattanooga & St. Louis	103.1	113.4													36	
Newburgh & South Shore							5.3	10.5							4	4
New York Central Lines:																
Boston & Albany							1.6	3.2							3	
Chicago, Indiana & Southern	17.4	17.4													6	3
Cincinnati Northern	206.1	206.1													40	27
Cleveland, Cincinnati, Chicago & St. Louis	763.8	1,016.0	103.6	169.8											226	34
Lake Erie & Western	871.8	880.8													151	111
Lake Shore & Michigan Southern	967.2	988.3	87.5	87.5											207	111
Dunkirk, Allegheny Valley & Pittsburg	90.3	90.3													17	15
Lake Erie, Alliance & Wheeling			87.7	87.7											22	16
Michigan Central	920.2	939.3													137	71
New York Central & Hudson River	2,214.0	2,729.7	2.9	11.6	.9	1.8	4.1	8.1	40.3	110.9	369.3	1,239.7			731	292
Peoria & Eastern			5.3	7.0											6	
Pittsburg & Lake Erie							22.7	25.6							15	9
New York, New Haven & Hartford	199.1	245.0							237.8	627.2	1.0	2.0	2.2	2.2	163	36
Norfolk & Western	1,015.9	1,117.9	490.9	550.6											262	137
Northern Pacific	750.1	845.6	638.6	864.7									1.3	1.3	245	22
Northwestern Pacific	199.2	199.2	51.3	51.3											35	29
Cleveland, Akron & Columbus	142.1	157.7													30	
Cincinnati & Muskingum Valley	11.4	11.4													3	
Pennsylvania	1,888.0	3,058.1	355.5	526.6	.8	1.6					10.9	10.9			618	61
Grand Rapids & Indiana			2.2	4.4											3	3
Northern Central	367.1	549.1	60.8	61.8							.7	1.4			120	18
Pennsylvania Company	615.9	1,043.7	12.7	16.1											179	2
Philadelphia, Baltimore & Washington	284.5	508.0									1.6	3.2			95	13
Pittsburg, Cincinnati, Chicago & St. Louis	1,051.9	1,582.6	9.1	16.8							8.5	8.5			277	17
West Jersey & Seashore			79.7	113.2											23	13
Peoria & Pekin Union	6.0	12.0													3	
Pere Marquette	19.0	19.0													4	
Philadelphia & Reading	274.3	396.1	1.1	1.3							1.1	1.1	1.9	1.9	109	33
Atlantic City	22.6	22.6													8	8
Northeast Pennsylvania													1.7	1.7	2	2
Perkiomen	38.1	38.1													12	9
Reading & Columbia	35.7	35.7													12	12
Queen & Crescent Route:																
Cincinnati, New Orleans & Texas Pacific													.7	.7	2	
Richmond, Fredericksburg & Potomac	87.0	174.7											.7	.7	20	2

TABLE 3.—THE BLOCK SYSTEM ON AMERICAN RAILWAYS—METHODS AND APPARATUS, MANUAL SYSTEM.—(*Continued.*)

Names of railroads.	Telegraph.		Telephone.		Electric bells.		Controlled manual.						Electric train staff.		Block signal stations.	
							No track circuit.		Track circuit at stations.		Continuous track circuit.					
	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Total number.	Number closed part time.
St. Joseph & Grand Island					.3	.3									1	
St. Louis & San Francisco	4.1	8.2	270.5	270.5									5.1	5.1	61	25
St. Louis Merchants' Bridge Terminal	1.1	2.2													3	
Seaboard Air Line			206.6	206.6									6.9	6.9	46	16
Southern	1,817.5	2,057.2	11.0	11.0									5.9	5.9	381	115
Southern Pacific: Pacific System											1.0	1.0	94.4	94.4	39	
Spokane, Portland & Seattle	8.4	11.4													5	
Terminal R. R. Assn. of St. Louis									1.1	2.2					2	
Union							.5	.5			.9	.9			2	
Union Pacific													10.9	10.9	4	
Vandalia	237.9	275.9													60	
Virginia & Kentucky			.6	.6											1	
Virginian	2.2	2.2													2	2
Wabash	1,820.7	1,914.7													267	129
Washington Southern	32.2	64.3													9	
Western Ry. of Alabama							138.0	138.0							15	
Total	39,477.4	45,857.3	8,105.0	9,859.7	945.1	1,406.5	1,909.5	1,935.3	385.8	953.5	491.5	1,371.3	270.2	272.5	9,898	3,713

a (Atchison, Topeka & Santa Fe: Western Lines.) These figures include 22.7 miles of double track road on which the electric train staff is used for trains moving in one direction (down grade), and the simple manual block system, by means of the telephone, for trains moving in the opposite direction.

TABLE 4.—THE BLOCK SYSTEM ON AMERICAN RAILWAYS—PRACTICES, MANUAL SYSTEM.

Names of railroads.	Permissive signaling forbidden.		Permissive signaling allowed.						Rear-end protection only.		Stop at station recognized as stop for signal opposite office.	
			By three-position signal.		By two-position signal and flag or lantern.		By caution card.					
	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.
Atchison, Topeka & Santa Fe:												
Eastern Lines			870.0	1,323.4			a 7.7	7.7				
Western Lines			a 559.9	561.1			a 28.5	28.5				
Coast Lines	4.3	4.3										
Gulf, Colorado & Santa Fe							a 2.1	a 2.1				
Atlanta & West Point	87.0	93.0										
Atlantic Coast Line	76.0	103.2					411.8	477.4				
Baltimore & Ohio	179.8	240.7	823.7	1,578.0								
Baltimore & Ohio Southwestern			b 579.1	631.6	b c 394.7	398.1			973.8	1,029.7	973.8	1,029.7
Baltimore & Sparrows Point			3.0	6.0								
Bessemer & Lake Erie							195.1	299.6				
Boston & Maine	4.8	9.6										
Buffalo, Rochester & Pittsburgh					a 422.0	546.2						
Chicago, Indianapolis & Louisville			537.7	537.7								
Caldwell & Northern	2.4	2.4										
Central of Georgia	59.7	66.1										
Central Vermont	1.5	1.5										
Chesapeake & Ohio							a 1,464.7	1,735.7			1,020.9	1,020.9
Coal River							69.3	69.3				
Chicago & Alton							c 141.2	141.2				
Chicago & Eastern Illinois	13.0	13.0	208.3	265.8								
Chicago & Northwestern							c 2,530.8	2,646.1			2,530.8	2,646.1
Chicago & Western Indiana					9.5	22.2						
Chicago, Burlington & Quincy	60.3	67.5			d 8,614.9	9,152.3	a 1,201.5	1,201.5	6,802.7	6,802.7	8,673.8	9,214.2
Chicago Great Western	291.0	317.8										
Chicago, Milwaukee & St. Paul	313.0	335.7					a c 3,559.1	3,821.4				
Chicago, Milwaukee & Puget Sound							c 1,076.0	1,076.0				
Chicago, Rock Island & Pacific							b 1,151.8	1,151.8			1,151.8	1,151.8
Chicago, St. Paul, Minneapolis & Omaha							c 649.6	719.3				
Cincinnati, Hamilton & Dayton			51.6	72.0								
Cincinnati, Indianapolis & Western					c 41.8	41.8	c 41.8	41.8				
Colorado Midland	2.0	2.0										
Cornwall & Lebanon					c 22.0	35.7						
Cumberland & Pennsylvania			7.3	13.3								
Cumberland Valley	2.0	2.0	a b 17.6	17.6								
Davenport, Rock Island & Northwestern					c 41.7	42.8						
Delaware & Hudson	.6	.6										
Delaware, Lackawanna & Western	5.8	5.8										
Duluth & Iron Range	16.8	20.8										
Duluth, South Shore & Atlantic	4.2	4.2										
Durham & Southern									56.0	56.0		
Elgin, Joliet & Eastern					c 9.2	9.2						
Erie			c 1,225.0	1,806.5							1,225.0	1,806.5
Chicago & Erie			c 248.8	257.2							248.8	257.2
Columbus & Erie			c 22.4	32.2								
New Jersey & New York			c 26.1	26.1							26.1	26.1
New York, Susquehanna & Western and Wilkes-Barre & Eastern			c 20.7	20.7								
Great Northern	19.9	19.9			a c 239.8	239.8	a c 239.8	239.8			239.8	239.8
Hocking Valley			b 74.7	74.7								
Illinois Central	5.0	10.0										
Iowa Central					c 11.0	c 11.0						
Kanawha & Michigan	1.3	1.3										
Kansas City, Clinton & Springfield	2.5	2.5										
Kentucky & Indiana Bridge & R. R. Co			9.7	14.6								
Lackawanna & Wyoming Valley	3.4	5.8										
Lehigh Valley	735.6	796.1										
Long Island							22.7	45.4				
Louisville & Nashville			216.3	265.2								
Marquette & Southeastern			3.7	3.7								
Minneapolis, St. Paul & Sault Ste. Marie							2,185.7	2,190.1				
Missouri Pacific	14.1	21.1					20.0	20.0				
St. Louis, Iron Mountain & Southern	7.9	9.0										
Mobile & Ohio	17.6	17.6			c 24.8	24.8						
Missouri, Kansas & Texas	8.6	8.6										
Mississippi Central					b 150.0	150.0			150.0	150.0	150.0	150.0

Table 4.—The Block System on American Railways—Practices, Manual System.—(*Continued.*)

Names of railroads.	Permissive signaling forbidden.		Permissive signaling allowed.						Rear-end protection only.		Stop at station recognized as stop for signal opposite office.	
			By three-position signal.		By two-position signal and flag or lantern.		By caution card.					
	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.
Nashville, Chattanooga & St. Louis	98.2	103.1										
Newburgh & South Shore					[b] 5.3	10.5						
New York Central Lines:												
Boston & Albany	1.6	3.2										
Chicago, Indiana & Southern	17.4	17.4										
Cincinnati Northern							[a] 206.1	206.1			206.1	206.1
Cleveland, Cincinnati, Chicago & St. Louis	851.1	1,169.5			16.3	16.3						
Lake Erie & Western	18.6	18.6	[b] 853.2	862.2							853.2	862.2
Lake Shore & Michigan Southern							[a] 1,054.7	1,075.8			1,054.7	1,075.8
Dunkirk, Allegheny Valley & Pittsburg							[a] 90.3	90.3			90.3	90.3
Lake Erie, Alliance & Wheeling							[a] 87.7	87.7			87.7	87.7
Michigan Central	920.2	931.3									920.2	931.3
New York Central & Hudson River	2,507.5	3,853.9					[a] 124.0	248.0				
Peoria & Eastern					5.3	7.0						
Pittsburgh & Lake Erie	22.7	25.6										
New York, New Haven & Hartford	2.2	2.2					[c] 437.9	874.2				
Norfolk & Western	12.9	12.9	1,296.4	1,458.1	197.5	197.5			1,054.2	1,054.2		
Northern Pacific	666.9	751.9					723.1	959.7			1,390.0	1,711.6
Northwestern Pacific	250.5	250.5										
Pennsylvania			[a] 1,736.2	2,742.4	519.0	854.8	519.0	854.8				
Cleveland, Akron & Columbus			[a b] 142.1	157.7							142.1	157.7
Cincinnati & Muskingum Valley			[a b] 11.4	[a b] 11.4							11.4	11.4
Grand Rapids & Indiana	2.2	4.4										
Northern Central			[a b] 168.6	303.3								
Pennsylvania Company			[a b] 628.6	1,059.8							628.6	1,059.8
Philadelphia, Baltimore & Washington	101.5	182.0	[c] 184.6	329.2								
Pittsburgh, Cincinnati, Chicago & St. Louis			[ab] 1,069.5	1,607.9							1,069.5	1,607.9
West Jersey & Seashore							[c] 79.7	113.2				
Peoria & Pekin Union			[c] 6.0	12.0								
Pere Marquette	19.0	19.0										
Philadelphia & Reading	63.4	114.2					[a] 215.0	286.2				
Atlantic City	22.6	22.6										
Northeast Pennsylvania	1.7	1.7										
Perkiomen							[b c] 38.1	38.1				
Reading & Columbia							[b] 35.7	35.7				
Queen & Crescent Route												
Cincinnati, New Orleans & Texas Pacific					[b] .7	.7						
Richmond, Fredericksburg & Potomac							[a] 87.7	175.4	87.7	175.4		
St. Joseph & Grand Island			.3	.3								
St. Louis & San Francisco	48.9	53.0					[c] 230.8	230.8				
St. Louis Merchant's Bridge Terminal	1.1	2.2									1.1	2.2
Seaboard Air Line	6.9	6.9					[c] 206.6	206.6				
Southern	16.9	16.9					[c] 1,817.5	2,057.2			1,834.4	2,074.1
Southern Pacific, Pacific System	95.4	95.4										
Union Pacific							10.9	10.9				
Spokane, Portland & Seattle									8.4	11.4	8.4	11.4
Terminal Railroad Association of St. Louis	1.1	2.2										
Union	1.4	1.4										
Vandalia			[b] 237.9	275.9							237.9	275.9
Virginia & Kentucky	.6	.6										
Virginian	2.2	2.2										
Wabash							[c] 1,820.7	1,914.7	769.1	769.1		
Washington Southern							[a] 32.2	64.3	32.2	64.3		
Western Railway of Alabama	138.0	138.0										
Total	7,832.8	9,984.9	11,840.4	16,327.6	10,725.5	11,760.7	22,816.9	25,444.4	9,934.1	10,112.8	24,776.4	27,707.7

[a] Permissive signalling is practiced only in the case of a freight train following a freight train, or in similar movements where neither train carries passengers.
[b] By rule.
[c] By dispatcher.
[d] (Chicago, Burlington & Quincy.) On 4,382.8 miles of road the block system is not used for all trains. Stopping beyond signal applies only to local trains.

ployed in the operation of the manual block system are given herewith.

SPEED CONTROL SIGNALS ON THE INTERBOROUGH.

At the meeting of the Railway Signal Association in New York this week, J. M. Waldron, signal engineer of the Interborough Rapid Transit Company, gave a brief talk on the arrangement that he has introduced at the principal stations on the express tracks of the subway in Manhattan by which trains can with safety be run closer together than formerly, thus materially increasing the capacity of the road. At and near the stations he introduces very short block sections, and compels a reduction of the speed of the trains before they are allowed to enter the short sections. He said, in part:

Speed control signals are intended to compel trains to observe certain fixed pre-determined speeds, and are used on approaches to stations and on approaches to junctions; at junctions, to permit a train to approach near to the junction at a time another train is passing over it; at stations, to permit a train to approach near to the station at the time the track in the station is occupied by another train.

Block signals in the New York subway are automatic. Interlocking signals are semi-automatic. Operating in connection with these signals are automatic stops to apply the brakes on trains automatically should the motorman disregard the stop indication. The successful operation of the automatic stop requires the use of overlapping track circuits; the length of such overlap must be more than the braking distance of a train when moving at its maximum speed.

Subway cars are equipped with very efficient brakes. Tests have shown that a ten-car train weighing more than 900,000 lbs. when running at a speed of forty miles an hour on a 3.1 per cent. minus grade, was brought to a stop inside of 700 ft. With brakes so efficient, what is the object of bringing trains so close together? Surely 700 ft. is not an excessive distance for keeping trains apart; the time consumed in running this short distance ought not to materially interfere with the traffic of a railway. But one-fifteenth of the population of the whole United States lives within twenty miles of the City Hall in New York, and it is necessary to save seconds.

The lines of the Interborough Rapid Transit Company, which include the elevated roads of the Boroughs of Manhattan and the Bronx, and the subway in the Boroughs of Manhattan, Bronx and Brooklyn, operate 29,254 cars made into 4,236 trains, carrying about 2,000,000 of people, each twenty-four hours. The car mileage each day is more than 14½ times around the world at the equator. While the population is increasing very rapidly, the traffic is increasing much faster.

The Interborough, realizing that for the time being it was impossible to immediately build additions to the subway lines devoted its energies to increasing the carrying capacity of the present roads to their utmost limits. The question of

building reservoir stations was seriously considered, and the influence such stations would have on increasing the capacity of the roads was carefully worked out; the building of additional tracks at congested points was considered, and the per cent. increase in capacity which these additional tracks would give was calculated, but owing to the cost and to the great difficulty of doing this work in a crowded city, while at the same time, the operation of more than 1,900 subway trains

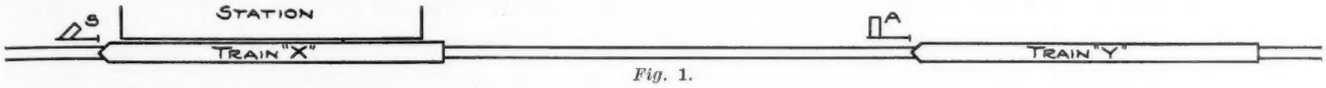


Fig. 1.

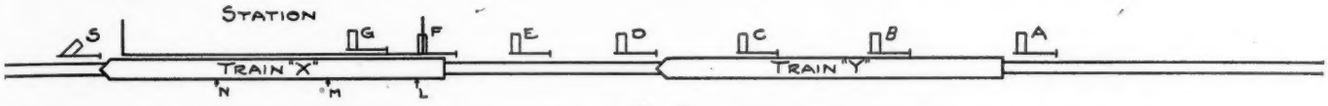


Fig. 2.

Arrangement of Automatic Block Signals at Express Stations, Interborough Rapid Transit Co., New York City.

Fig. 1 shows the arrangement of signals as originally installed at express stations. With train X in the station, the following train, Y, is held at signal A. Signal A clears when rear end of train X has passed signal S.

Fig. 2 shows the speed control signals as now installed at express stations. With train X in the station, the following train, Y, can proceed at a certain predetermined speed to signal D. Signal D clears when rear end of train X has passed L; signal E when rear end of train X has passed M; signal F when rear end of train X has passed N; signal G when rear end of train X has passed signal S.

a day must not be interfered with, these schemes were given up and another solution was sought. That solution was the devising and installation of the "speed control signals."

The length of the station stop is determined by the time consumed in the unloading and loading of trains. This is practically a fixed quantity. While everything possible is done to reduce this stop, it is found that there is a fixed minimum under which it is impossible to go.

Prior to the installation of the speed control signals, the spacing of trains was such that the front end of train "Y," Fig. 1, when approaching a station, was always held from the rear end of train "X," Fig. 1 standing in a station, a distance sufficient to bring train "Y" to a stop before its front end reached the rear end of train "X."

The automatic application of the brakes keeps trains the stopping distance apart. Under this system, it was impossible to operate trains at a headway of less than two (2) minutes.

Speed control signals operate and control trains in the following manner: Train "X," Fig. 2, is standing at a station platform, signal "A" is at caution and signals B, C, D, E, F and G are at stop indication, automatic trips at signals B, C, D and E are at the stop position, trip at signal "A" is clear; signal "B" is located at braking distance from rear end of train "X." When train "Y" passes signal "A," this signal immediately goes to the danger position; when it reaches that position, it starts in operation a timing device which makes contacts after a fixed time which clear signal and stop "B," providing blocks B, C, D and E are clear. This timing device is so adjusted that the motorman must reduce the speed of his train an amount sufficient to consume a pre-determined time interval in running from signal "A" to signal "B." After the front end of train "Y" passes signal "B," this signal goes to the stop position at once and starts a timing device in operation which closes the circuits controlling signal and stop "C" and will clear them providing blocks C, D and E are not occupied. The timing device at signal "B" is so adjusted that train "Y" must take a fixed pre-determined time in moving from signal "B" to signal "C." If train "Y" travels this distance in less than the allotted time, its front end will reach signal and stop "C" before they have cleared, with the result that the train will be tripped and brought to a stop automatically, and as train "Y" has been compelled to reduce its speed in moving from signal "A" to signal "B," its speed is now sufficiently low to bring it to a stop before it reaches rear of train "X," even though its braking distance is much reduced. Train "Y" can now proceed to signal and stop "D," where it is held until train "X" starts to move out of the station. When rear end of train "X" has passed "L" signal and stop, "D" clears. Train "Y" now continues on to signal "E." This signal will not clear until rear end of train "X" has passed "M." It then clears and train "Y" can proceed to signal "F." This signal and stop will clear when rear end of train "X" has passed "N." Train "Y" can now move onto signal "G," which will not clear until rear end of train "X" has passed by the exit end of the platform.

Signals A, B, C, D, E, F and G are so located that train "Y" can continue to move in towards the station without interruption, while train "X" unloads and loads its passengers and moves out of the station. Thus, the time consumed in making additional stops is eliminated. If there should be no train in the station when train "Y" approaches, all signals will be clear and train "Y" can enter station without reducing speed, likewise, if train "X" should leave the station when train "Y" is approaching under control, all signals between train "Y" and the station will immediately show the clear indication

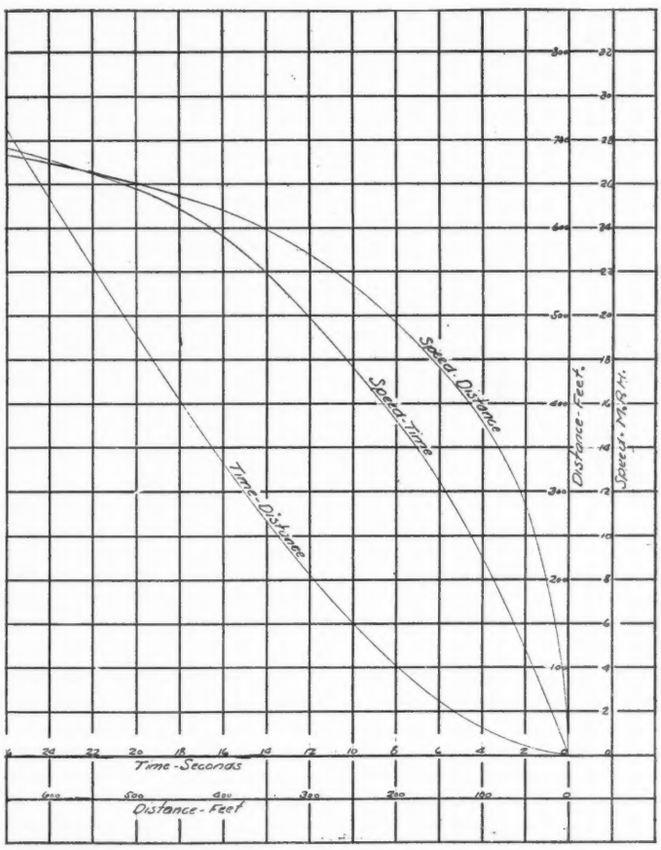


Fig. 3—Time—Speed Diagram; Trains Entering Stations.

when train "X" leaves the station. The time and speed curves for train "Y" entering a station are shown on Fig. 3.

The following comparison of conditions is based on records of northbound express trains through Grand Central Station:

	As in Fig. 1.	As in Fig. 2.
Headway	2 min. 0 sec.	1 min. 39 sec.
Station stop	0 min. 46 sec.	0 min. 46 sec.
Trains per hour	30	36.4
Cars per hour	240	291
Gain in capacity	...	21.3 per ct.

General News Section.

Aeroplane wrecked in Kansas by the suction of a passing railway train. More ruinous competition!—*Wall Street Journal.*

The Northern Pacific is now using oil-burning switching engines in Tacoma, and will soon use oil fuel on the locomotives of the passenger trains between Tacoma and Portland.

The Minneapolis, St. Paul & Sault Ste. Marie is to pay pensions to its employees. The plan will be similar to that which has been in force for some time on the Canadian Pacific. The M., St. P. & S. S. M. is controlled by the Canadian Pacific.

The Chicago & North Western has presented to the University of Illinois the locomotive testing plant which for a number of years has been in use at its shops in Chicago. This plant was built for the railway company under the direction of Robert Quayle.

According to the *St. Paul Pioneer Press*, the railways west of that city (particularly the Northern Pacific) have, as a result of the impairment of business prospects by recent court and legislative action, discharged several thousand laborers engaged on new construction.

The Western Electric Company has taken orders from the Atchison, Topeka & Santa Fe for telephone equipment for the lines from Newton, Kan., west to Gainesville, Tex.; from Temple, Tex., to Galveston, Tex.; from Temple to Brownwood, Tex., and from Wichita, Kan., to Clovis, N. M.

The Erie Railroad is now using two of the four tracks of its new line through the Bergen hill cut, approaching Jersey City, and all passenger trains, excepting those of the Northern of New Jersey, now reach the terminal without passing through the tunnel. The ruling grades of the new line are 35 ft. to the mile.

On the night of June 9, near Robsart, N. M., eastbound passenger train No. 2, of the El Paso & Southwestern, was stopped by a robber, who compelled the passengers in the sleeping car to give up all their valuables. The robber had boarded the train at the last station and stopped it simply by ordering the Pullman conductor and a brakeman to pull the bell cord, enforcing this order with a gun.

The University of Pittsburgh (Pa.), beginning next autumn, will provide practical as well as theoretical instruction for students in engineering by giving them employment during four terms of three months each in engineering industries in the Pittsburgh district. Thus in the space of four years a student will have had 12 months' shop or laboratory experience. Arrangements have been made with establishments where mechanical, electrical, chemical and sanitary engineering can be practiced. The university will co-operate with the management of the shops, but the student will be an actual employee of the concern and will work six days in a week and receive the regular wages of student apprentices. The student will report to an instructor at the university every two weeks.

Superintendent R. T. Morrow, of the Pittsburgh division of the Pennsylvania Railroad, in furtherance of the continuous campaign which the Pennsylvania is waging against trespassers, has written a letter to the mayor or other chief officers of each city and borough through which his lines run asking for the co-operation of the local authorities in keeping people off the railway right-of-way; not only children but grown people; not only tramps but those who are respectable. The letter in itself is quite mild. Mr. Morrow "respectfully asks that the mayor take such action as, in his judgment, is warranted." We venture to hope, however, that there is something to be read between the lines. Indeed, it has recently been announced that on some of its lines the Pennsylvania has stationed watchmen to see that warnings against trespassing are respected. The company has reduced the number of trespassers killed and injured during the past three years and proposes to reduce it still farther.

The Southern Railway has increased the pay and decreased the working hours of its telegraph operators in accordance with the decision of the arbitrators appointed under the Erdman act to mediate the differences between the company and its 2,100 telegraphers. The increase in pay amounts to approximately $40 per man per annum, or a total of nearly $9,000. The hours of the one-operator offices are shortened from thirteen to ten, and where two or more operators are employed the hours are reduced from nine to eight. Fifteen days' leave of absence with pay was awarded all operators who have to work as much as five hours a day on Sundays or on legal holidays. This applies to telephone operators as well as telegraphers. The board of arbitrators was composed of J. S. B. Thompson, of Atlanta, Ga., assistant to the president of the Southern Railway; J. J. Dermody, vice-president of the Telegraphers' Union, and Prof. William R. Vance, dean of the law faculty of the George Washington University.

Letter from A Railway Man to His Son, Just "Set Up" from Fireman.

Dear Son: Enclosed herewith is an explanation of Rule 4 of the Standard Code of Train Rules, adopted some time since by the road with which you are identified. * * * That engine and trainmen do not understand the rules is due both to their own lack of interest in their profession and to the failure of their superiors to understand the rules; or, if they do understand them, to make them clear to those employees who have to observe them. Business men are divided into two classes, viz.: Successful, or lucky, and unsuccessful, or unlucky. * * * Good luck does not come to those who do not put forth their best efforts. There are men on all roads who make little or no effort to prepare themselves for increased responsibilities until the word goes out that there are to be promotions. When called upon for examination some pass and some do not. Many of those who do pass again cease all effort; and if asked why, will answer that they know the rules; otherwise they would not have been promoted. The doctor who closes his medical books when admitted to practice develops into a quack. The same may be said of the railway man who closes his book of rules and makes no further effort. There is no such thing as luck on railways. The lucky man is a business man; the unlucky man is not. Engine and trainmen should be better business men than all others, for a failure means loss of reputation, and often of life and limb. There are engine and trainmen on every railway who are looked upon as authorities on the rules—men who are called upon by their fellow-employees to decide questions. There is no reason why every man should not be an authority in his profession. Every road has employees who make successful trips year after year. Their success is charged to good luck. Take a trip with one of these men and you will discover the secret of their success; it is not good luck; they are business men. Then take a trip with an unlucky man and you will soon discover the secret of his bad luck—he is not a business man. You alone must decide in what class you are to journey through life. * * *

Change in the Air-Brake Law.

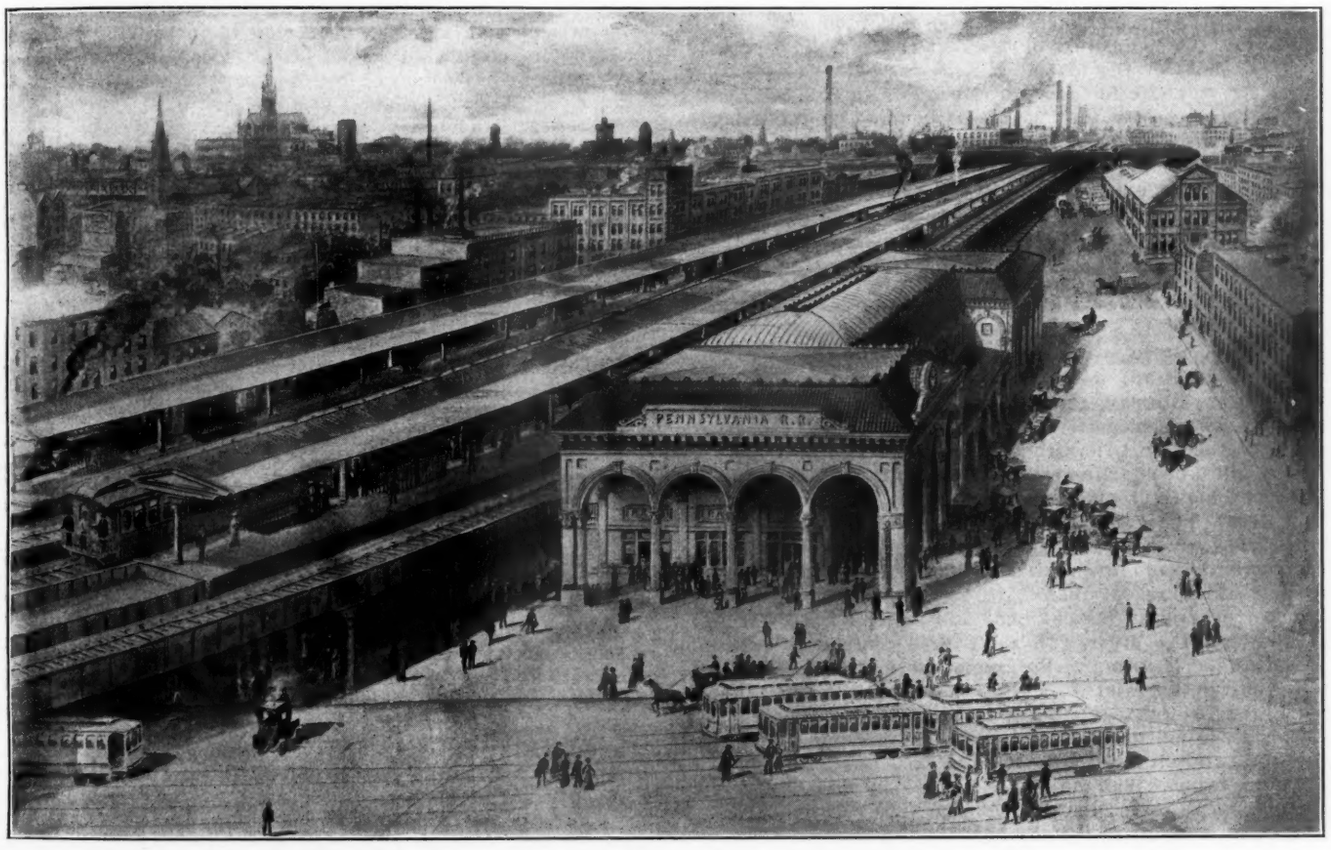
The Interstate Commerce Commission, in an order dated June 6, has increased from 75 per cent. to 85 per cent. the minimum proportion of power brakes to be used in all trains on railways engaged in interstate commerce. The order says:

"That on and after September 1, 1910, on all railways used in interstate commerce, whenever, as required by the Safety Appliance Act as amended March 2, 1903, any train is operated with power or train brakes, not less than 85 per cent. of the cars of such train shall have their brakes used and operated by the engineer of the locomotive drawing such train, and all power-brake cars in every such train which are associated together with the 85 per cent. shall have their brakes so used and operated."

Proposed Pennsylvania Improvements in Newark.

The Pennsylvania has prepared plans for extensive improvements of the main line in Newark, N. J. The four-track elevated line is to be completed from Fifteenth street, Harrison (east of the river), to a point west of the Newark station, except that the gauntlet over the Passaic river drawbridge will have only two tracks. At present there are two tracks at the Market street station, which is the main station in Newark. With the addition of two more tracks there will be island platforms, one for the two eastbound tracks and another for the westbound. These platforms will be about 30 ft. wide at the widest point and about 800 ft. long. Waiting rooms will be provided on each platform, with entrance stairs leading up direct from the new station, and there will be exit stairs to Market street. Baggage lifts will be provided, so that a minimum amount of trucking will be necessary on the platforms. These platforms will be about level with the floors of the cars and passengers can board trains without using steps, just as will be the case at Harrison Transfer station. The widening necessary for these platforms will require the construction of a new passenger station larger and handsomer than the present structure, to be situated nearly on the site of the present station.

The city of Newark will be asked to vacate Railroad avenue on the north side of the tracks from Lafayette street to Hamilton street, in lieu of which the railroad company will purchase the property and construct a new and wider thoroughfare a short distance north of the existing street. The estimated cost of the improvements is about $500,000.



Study for New Passenger Station at Newark, New Jersey; Looking West. Pennsylvania Railroad.

A Good Word for the Porter.

There is one class of railway employees whose wages are never raised—the humble Pullman car porter. Prices may rise and the cost of living go up by leaps and bounds, yet no one ever suggests an increase of the less than one-dollar-a-day wage these men receive. True they are given tips, and the comic weeklies are always having their fling at the millionaire porter. Nothing could be a bitterer jest—for the porter. Tips fall off or decrease as railway rates go up, with other expenses. On some runs a man can make little; on others the physical hardships are very great, involving days of hard work and nights of little sleep and much discomfort. The Pullman Company makes millions—such enormous profits that the Interstate Commerce Commission has ordered a reduction of rates for upper berths—but it still charges against the porters' pay all loss and breakage. If a passenger steals a towel or a hair-brush the porter must pay for it; no excuse is accepted. The car company also encourages the tipping idea, so that it may shift part, perhaps half, of its wage burden upon the traveling public. Long and faithful service, devotion to the company's interest, all count for nothing. The best porter in the country cannot hope to be a Pullman conductor, because of his color. The vast majority of porters, be it noted, are honest, obliging and well-behaved; cases of dishonesty or flagrant misbehavior are extremely rare.—*Evening Post*, New York.

Governor's Island to Philadelphia Without a Stop.

On Monday last, June 13, Charles K. Hamilton flew, in his biplane, from Governor's island, New York harbor, to Philadelphia, about 85 miles, in one hour, 50 minutes, and after a rest of two hours returned to New York; but on the return journey a fault in his motor compelled him to alight at South Amboy, N. J., and he was detained there six hours making repairs. He reached New York, however, finally at 6:40 p.m., about 11 hours from the time of his departure, and secured a prize which had been offered by the *New York Times*. Hamilton followed the line of the Pennsylvania Railroad as nearly as possible and had a special train on that road to carry his friends and to guide him. He landed in Philadelphia near North Penn junction. The time, it will be seen, was only a trifle slower than that of the fastest express trains between the two cities. Northbound, he left North Philadelphia at 11:30 and passed in sight of Rahway at 12:50. From

Metuchen he followed the Lehigh Valley road and landed in South Amboy, as before stated. The following record is from the *New York Tribune*:

Record of Flight—New York to Philadelphia and Return.

Time.	Place.	*Miles.
7:35	New York.....	....
7:54	Elizabeth, N. J.....	17.1
7:58	Rahway	22.4
8:09	Metuchen	28.8
8:11	New Brunswick ...	34.3
8:29	Monmouth Junction	44.0
8:38	Princeton Junction.	50.0
8:50	Trenton	59.0
9:03	Bristol, Pa.	69.8
9:11	Cornwell's	75.3
9:25	North Philadelphia	87.7

*Three miles circling at start are included in flight before reaching Elizabeth. At North Philadelphia Hamilton flew in circles for three miles, not included in above table.

Time.	Place.	Miles.
11:30	North Philadelphia	....
11:46	Cornwell's	12.0
11:53	Bristol	18.0
12:06	Trenton	27.0
12:18	Princeton Junction.	36.7
12:25	Monmouth Junction	42.7
12:34	New Brunswick ...	51.5
12:43	Metuchen	58.3
12:50	Rahway	*64.7
12.54	Ar. South Amboy ..	61.0
6:20	Lv. South Amboy..	....
6:40	New York (Governor's Island)	87.7

*Changed course, leaving the Pennsylvania Railroad. Delayed at South Amboy for repairs and supplies 5 hrs. 26 mins.

In the first hour of the return trip Hamilton traversed 52 miles. At the completion of the round trip at night he said that for most of the distance, both ways, he had remained about 500 ft. above the ground. He said also that but for the thousands of people that gathered around him the delay at South Amboy would not have been over an hour and a half.

At Indianapolis on Monday Walter Brookins, in a Wright biplane, rose to a height of 4,384 ft., reaching that altitude by traveling in a circle at a speed estimated, most of the time, at 60 miles an hour.

Railway Matters in Washington.

Washington, June 15, 1910.

The railway bill was finally fixed up in the Conference Committee yesterday, and it is now being discussed in the Senate. The Democratic conferees did not sign the report, however, and will probably file a minority report. The House will probably take up the revised bill tomorrow, and the more optimistic prophets say that it will go to the President this week. The greater part of the week has been taken up with informal conferences between the majority members of the committee and the parties with whom they find it necessary to make peace; that is to say, the president and the attorney general on the one hand and some of the Democratic senators on the other. In their first conference with the president the members of the committee found Mr. Taft quite strenuous in his wish to have restored to the bill the provision for Federal regulation of railway stock and bond issues. It was made pretty plain, however, that this could be carried through only with difficulty, if at all, and the president withdrew his request; but the law will empower him to appoint a commission to investigate the subject. The principal features of the bill as reported are the following:

Provisions of the Bill.

A Commerce Court of five judges. Practically all of the House provisions relating to the administrative features of the bill. Telegraph, telephone and cable companies are brought under the federal law. Both wire and wireless telegraph companies are included. The revised requirements with respect to classifications, rates, packing, marking, delivery, and other steps of transportation. The stiffened long and short haul section, modifications to be allowed only by the commission after hearing, and only in "special cases." Rates reduced by the railways in competition with water carriers must not be subsequently raised without the permission of the commission. It is made the duty of the carrier to quote rates in writing, with a penalty of $250 for mistake. The commission may suspend rate increases 120 days and, if necessary for investigation of the matter, six months additional. But these questions must be given preference over others and must be expedited. On rates increased since January 1, 1910, the burden of proof is on the carrier to show the increase reasonable. Revised clause making it unlawful for shippers to misrepresent the weight, cost, value, or nature or extent of injury of their goods. The commission may investigate on its own motion. Through rates and classifications shall not be made by the commission between railways and street electric railways, or when the transportation is wholly by water. Shippers have the right to route their freight. Shippers may sue for recovery of money in any state court.

No interlocutory decree or injunction shall be issued by any federal court against any state law, unless heard before three judges, of whom one at least shall be a justice of the supreme court or a circuit judge. There must be at least five days' notice of such hearing. Annual reports to the commission shall be made as of June 30 or December 31, at the discretion of the commission. The bill provides the commission demanded by President Taft to investigate the propriety of a federal law to regulate the issuance of stock and bonds.

The principal sections left out are those permitting traffic agreements; to permit one railway to purchase stock of another which already is controlled, to make physical valuation of railways, and, as above stated, that authorizing federal regulation of stock and bond issues.

The provision permitting the commission to suspend rate increases goes into effect at once, as does that authorizing the appointment of a special commission to investigate the propriety of regulating stock and bond issues; all other provisions go into effect 60 days after the approval of the bill.

Activities of Shippers.

George J. Kindel, of Colorado, encouraged by the recent supreme court decision sustaining his complaint concerning freight rates from the east to Colorado, has now presented to the Interstate Commerce Commission a complaint against the charges of the express companies over the same routes.

A number of representative "shippers" of the West who take to themselves the credit of having induced the president to act in the rate matter, came to Washington this week and called at the White House to tender to him their thanks. The president reminded them of the danger of cutting off one's nose to spite one's face, and observed that the railways should be permitted to share in the prosperity of the country. Some of these shippers seem to feel some regret because their controversy has been so quickly taken out of the hands of the court and is now in the way of being dealt with by the Interstate Commerce Commission; they think the commission has been too friendly to the railways during the past year or two.

The increases in season ticket rates, announced by the New York, New Haven & Hartford and the New York Central, which have been the subject of much agitation before the New York State Public Commission, have now become a Washington topic, those parts of the new tariffs which are interstate having been made the subject of petitions to the Interstate Commerce Commission.

After the close of the conference between the railway officers and the president last week, there was a good deal of perplexity in trying to determine how to carry out the agreement which had been made. Presumably the arrangement to withdraw the proposed increases in the West was informally agreed to by the Interstate Commerce Commission, as members of that body were present at the White House conference; but it does not appear that any formal approval was given and so there has been a good deal of study in the effort to decide whether the increased rates were or were not in effect. Some of those interested say that the increases must remain in effect 30 days, if the law is to be complied with. It has been observed that if the roads maintain the advances contrary to the injunction which was issued by the court, they are guilty of contempt of court. In agreeing not to prosecute, President Taft was within his right and power, of course, but it does not appear that the court has vacated its injunction. The final conclusion seems to have been that rates announced as to go into effect June 1 were officially cancelled, and the old rates restored; those filed as going into effect July 1 have been changed so as to go into effect August 1.

The bill to reimburse the Southern Pacific for its expenditures in repairing the damage to the Colorado river in southern California and Mexico in 1907, was last week reported favorably in the Senate; but it names an amount of $713,647 instead of the larger sum—$1,663,136—which was named in the original bill.

Attorney-General Wickersham has applied to the United States circuit court at Chicago for an injunction against the Union Stock Yard & Transit Co., the Chicago Junction Railway and others to test the right of these local roads to engage in interstate commerce, they having failed to file tariffs.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.;
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; June 17; Omaha, Neb.
AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn.
AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'NS.—G. W. Dennison, Penna. Co., Toledo, Ohio.
AMERICAN ASS'N OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; during first week in month.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago; Oct. 18; Fort Worth, Tex.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 28-July 2; Atlantic City.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 29th St., N. Y.; 2d Tues.; New York.
AMERICAN STREET AND INTERURBAN RAILWAY ASS'N.—H. C. Donecker, 29 W. 39th St., New York; Oct. 10-14; Atlantic City.
ASSOCIATION OF AM. RY. ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wis. Central Ry., Chicago; June 20-24, 1910; Los Angeles.;
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., N. Y.; June 21-22; Colorado Springs.
BUFFALO TRANSPORTATION CLUB.—J. N. Sells, Buffalo.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; Thursdays; Montreal.
CAR FOREMAN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; Chicago.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton Building, Pittsburgh; 1st and 3d Tuesdays; Pittsburgh.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va
GENERAL SUPERINTENDENTS' ASSOC. OF CHICAGO.—H. D. Judson, 209 Adams St., Chicago; Wednesday preceding 3d Thurs.; Chicago.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.
INTERNATIONAL RAILWAY MASTER BLACKSMITHS' ASS'N.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit, Mich.
INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11, Brussels; July 4-16; Berne, Switzerland.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass., 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
NORTHERN RAILWAY CLUB.—C. L. Kennedy, C., M. & St. P., Duluth; 4th Saturday; Duluth, Minn.
OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; 2d Wed.
RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City; Third Friday in month; Kansas City.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
CANADA.—W. C. Pannell, Sec'y-Treas., Sou. Ry., Baltimore, Md.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio.
RICHMOND RAILROAD CLUB.—F. O. Robinson; 2d Monday; Richmond.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RY. FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Sta., Chicago.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. R. Ry., Montgomery, Ala.; annual, Oct. 20; Atlanta.
SOUTHERN & SOUTHWESTERN R.R. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.
TRAIN DESPATCHERS' ASSOC. OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; June 21; Spokane, Wash.
TRANSPORTATION CLUB OF TOLEDO.—L. G. Macomber, Woolsen Spice Co., Toledo.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo; annual meeting, Aug. 16-19; Niagara Falls, Ont.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; Wednesdays, except July and August; Chicago.

Traffic News.

The federal court has enjoined the Oklahoma low rate laws. See Court News.

August 1 is announced as the date for the opening of passenger traffic over the Western Pacific. There are to be two trains each way daily.

The National Tube Co., of Pittsburgh, is shipping 30,000 tons of steel gas pipe to Memphis and Shreveport by boat. This pipe is to be used for a line to convey gas from the Arkansas fields to New Orleans.

A press despatch from Montreal says that officers of the Grand Trunk and the Canadian Pacific are talking about the necessity of increasing freight rates; the situation in Canada is substantially the same as in the United States.

The New York Produce Exchange has complained to the Interstate Commerce Commission against the railways carrying export grain from Lake Erie to New York City, alleging that the rates now in effect give undue preference to grain grown in Canada.

An agricultural instruction train of nine cars is making a three-weeks' trip over the lines of the Northern Pacific in North Dakota and Montana. One of the cars is an open one, carrying exhibits of improved farm machinery. Special attention is being given to instructing new settlers in dry farming.

At the request of the Attorney-General of the United States, the Canadian Pacific and the Bangor & Aroostook have postponed to August 1 an increase of 10 per cent. in rates on lumber which had been announced to go into effect June 15; this for the purpose of allowing the Interstate Commerce Commission an opportunity to investigate the proposed increase.

The Chicago Association of Commerce has filed with the Illinois State Railroad Commission an elaborate complaint against alleged exorbitant rates charged by the express companies. The commission is asked to make a general reduction of 33⅓ per cent.; to establish rates based on weight and distance, and to make special suburban rates for Chicago and vicinity.

The Mayor of Mount Vernon, N. Y., complaining to the New York State Public Service Commission of the increased fares which have been announced by the New York, New Haven & Hartford, bases his argument in part on a contract which he says was made in 1879, in which the road, in consideration of certain concessions on the part of the people, agreed to maintain the present commutation fares.

In May, 1910, there were 8,528,286 net tons of freight passed through the two canals at Sault Ste. Marie. Of this total, 6,769,704 tons was eastbound freight and 1,758,582 tons westbound freight. Of the total tonnage, 3,158,967 tons passed through the United States canal and 5,369,319 tons through the Canadian canal. The tonnage was carried in 2,858 vessels, which carried, besides the freight, 1,387 passengers eastbound and 1,808 passengers westbound.

The trunk lines and the lines in the Central Passenger Association will make a rate of fare and one-half for the round trip for the Merchants' Association of New York City next autumn on the same plan as that employed in former years. The dates will be from trunk line territory (points 100 miles or more from New York City), July 16-19, August 13-16, August 27-30, September 10-13; return limit 15 days. From central territory, July 9-12, July 23-26, August 6-9, August 20-23; return limit 30 days.

The Pacific Steam Navigation Company has ceased its sailings from England to Chile, through the straits of Magellan, after an uninterrupted career of nearly 70 years. This is because of the completion of the railway between Chile and Argentina over the Andes mountains. By this new connection between the Atlantic and the Pacific coasts, the passenger and

mail traffic can reach the west coast so much quicker that the ships sailing around the Horn are no longer attractive. The Pacific Steam Navigation Company has been absorbed by the Royal Mail Steam Packet Company.

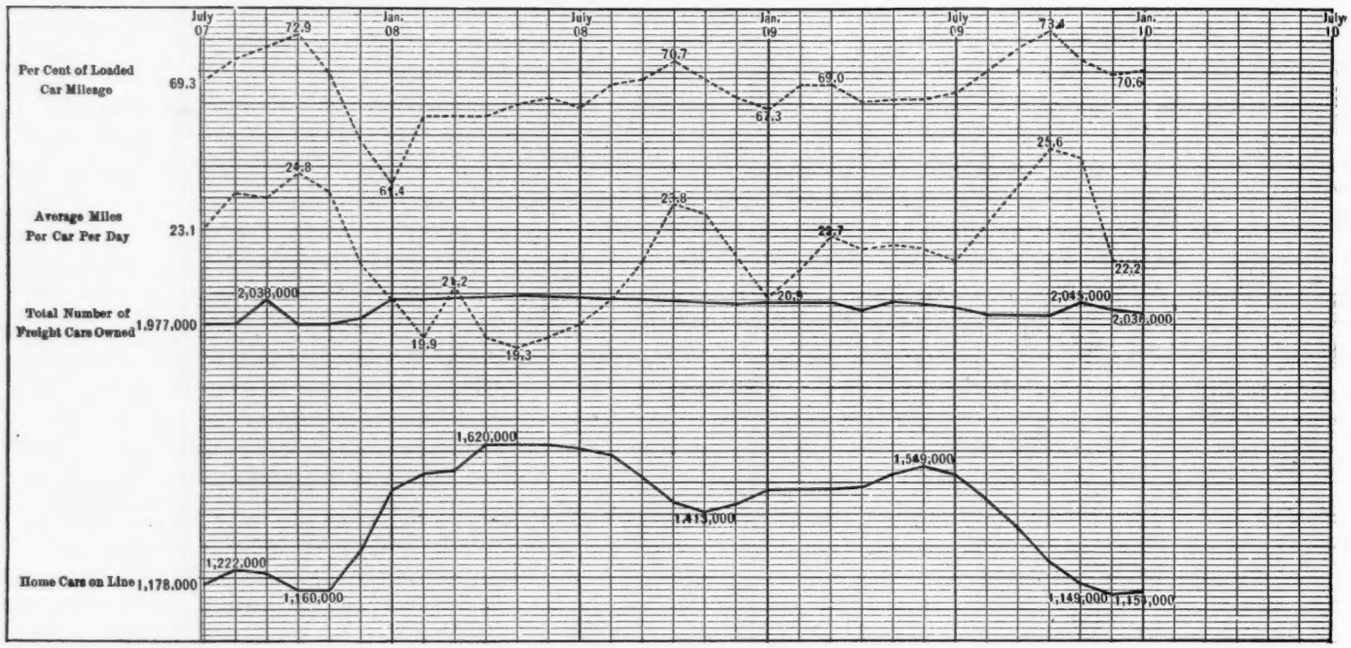
The Barge Canal Terminal Commission of the State of New York, which has been appointed by the legislature to investigate the question of terminal facilities for the enlarged Erie canal, especially at New York City, is to visit Europe this summer and make a five weeks' study of harbor terminals in England and on the continent. This commission consists of Frank M. Williams, state engineer; Frank C. Stevens, superintendent of public works; Edward A. Bond, chairman of the Canal Advisory Board of Engineers, and Harvey J. Donaldson, appraiser of canal lands.

The passenger committee of the Trunk Line Association has been discussing informally the question of establishing rates of fare for passengers riding in sleeping and parlor cars slightly higher than those charged passengers riding in ordinary cars, and it is probable that a conference will be held on the subject with passenger men in western and southern territory. A remark of Chairman Knapp, of the Interstate Commerce Commission in his dissenting opinion in the recent sleeping car case, has encouraged the passenger men to seriously consider the propriety and feasibility of making this very sensible change. Judge Knapp observed that as compared with other passengers, sleeping car passengers get too much rather than too little.

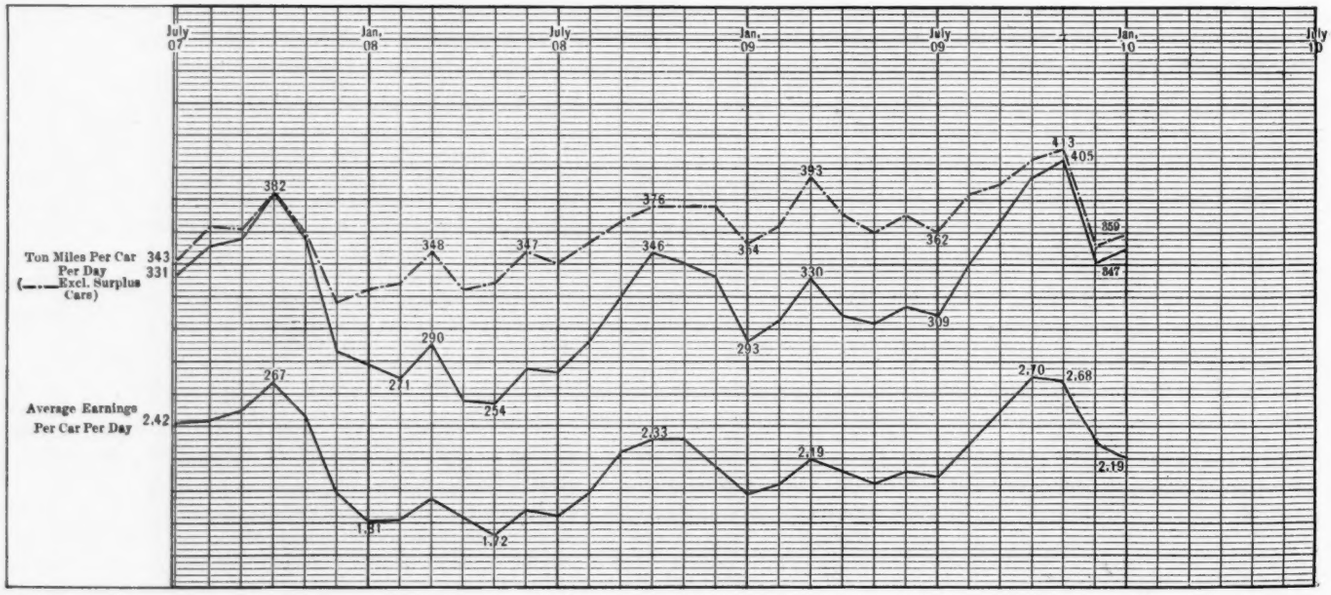
Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 72 covering car balance and performance for January, 1910, says:

"There was little change in the performance results as compared with December. The miles per car per day averaged 22.2, the same as during December. The loaded car mileage averaged 70.6 per cent. of the total, an increase of .7 points.



Car Balance and Performance.



Car Loading and Earnings.

The tons per loaded car show a decrease to 21.7, while the ton-miles per car per day increased from 342 in December to 347 in January. The increase in ton-miles per car per day in the face of decreased car loading and stationary mileage is explained by the omission of tonnage figures from the reports of several roads.

"The earnings per car on line decreased to $2.19. There was a slight increase in the shop percentage, which averaged 5.73 per cent. for the period covered by this report. The car balance percentages indicate a slight homeward movement of equipment, the cars on home lines having increased to 57 per cent. as against 56 per cent. in December.

"With this bulletin are introduced graphic charts covering the important averages of car balance and performance from July, 1907, to date. These charts will be continued from month to month."

Summary of Crop Conditions on June 1.

The following tabulation is a summary for the United States of crop conditions on June 1, with comparisons, as estimated by the United States department of agriculture:

Crop.	Condition June 1— 1910.	1909.	1908.	10-year average.
Winter wheat	80.0	80.7	86.0	81.9
Spring wheat	92.8	95.2	95.0	93.0
Oats	91.0	88.7	92.0	88.4
Barley	89.6	90.6	89.7	90.5
Rye	90.6	89.6	91.3	89.9
Hay (all)	86.1	87.6	96.8	....
Clover, for hay	86.6	84.3	96.7	86.4
Alfalfa	93.1	89.3	88.9	90.4*
Spring pasture	88.5	89.3	97.7	90.9
Apples	53.0	61.4	66.0	69.8
Peaches	62.0	54.1	73.0	65.0
Pears	63.2	61.8	70.9	....
Cabbages	88.5	89.2	90.4	87.8*
Onions	91.1	90.9	92.1	90.1*
Lima beans	86.3	88.0	89.9	....
Asparagus	91.2	89.2	91.7	89.0*
Blackberries	80.0	90.0	94.0	90.0*
Raspberries	79.2	88.4	91.9	82.1*
Watermelons	77.4	81.5	81.1	80.0*
Cantaloupes	77.8	81.8	81.9	80.0*
Hemp	85.6	85.9	86.0	85.0*
Sugar cane	84.7	90.6	91.3	89.7
Sugar beets	90.5	89.0	86.2	88.5
Cotton	82.0	81.1	79.7	....

*Averages for four years.

The general average condition of crop growth on June 1, 1910, was about 84.9, as compared with 85.0, 87.9, 77.8 and 85.5 on June 1, of 1909, 1908 and 1907, and the 10-year average, respectively.

Representing last year's acreages by 100, the preliminary estimates of this year's acreages are: Winter wheat, 102.5; spring wheat, 107.3 (all wheat 104.4); oats, 103.5; barley, 100.7; rye, 101.2; cotton, 102.8; clover for hay, 106.2; sugar cane, 104.2; the total of above crops, about 103.6.

Joint Standing Committee of St. Louis Railways and Business League.

The railways centering in St. Louis, following a conference last week with representatives of the Business Men's League, have agreed to establish a joint standing committee through which, as a medium, shippers and receivers of freight in St. Louis, acting through the Traffic Bureau of the Business Men's League, may confer on questions of rates and other matters of mutual interest. The conference was asked for by Mr. Carleton, chairman of the Board of Managers of the League, for the purpose of presenting certain objections to the advances in freight rates which were recently announced by the railways. Commissioner P. W. Coyle, chief of the Traffic Bureau, of the League, presented a brief argument calling attention to the fact that most of the reductions in freight rates which have been made in the last few years have been in commodity tariffs, thus, in the majority of cases, favoring dealers who ship in large quantities; while the class rates, which apply to the great bulk of the shipments made by St. Louis merchants, have remained stationary. The merchants represented in the Business Men's League therefore think that if the railways need more income they ought to attack first the commodity rates.

CAR BALANCES AND PERFORMANCES IN JANUARY, 1910.

	New England.	New York, New Jersey, Del., Md., Eastern Pa.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo. Oklahoma, Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned	76,200	666,468	216,370	199,571	173,205	338,984	16,907	134,370	27,304	117,736	99,014	2,036,129
Average number of system cars on line	41,374	364,498	114,568	96,548	86,668	223,785	6,099	76,602	18,218	59,630	66,403	1,154,393
Railroad-owned cars: Av. foreign on line	39,030	272,845	91,074	57,720	65,208	164,525	16,390	53,725	20,883	53,395	22,396	857,191
Total cars on line	80,404	637,343	205,642	154,268	151,876	388,310	22,489	130,327	39,101	113,025	88,799	2,011,584
Excess	4,204	.....	.....	.....	.....	49,326	5,582	.....	11,797	.....	.....	.....
Per cent. cars on line to total owned:												
Home	55	55	53	57	50	66	36	57	67	51	67	57
Foreign	51	41	42	34	38	49	97	40	76	45	23	42
All railroads	106	96	95	91	88	115	133	97	143	96	90	99
Private cars on line	3,344	42,330	11,430	3,171	7,040	16,612	1,704	6,615	2,088	8,492	3,020	105,846
Total, all cars on line	83,748	679,673	217,072	157,439	158,916	404,922	24,193	136,942	41,189	121,517	91,819	2,117,430
Per cent. of cars in shop	3.72	5.60	6.19	5.87	8.02	4.23	4.23	10.17	4.71	4.84	6.61	5.73
No. of freight engines owned	1,127	10,003	2,860	2,994	2,565	5,471	460	2,463	782	2,328	2,100	33,153
Av. cars on line per freight engine owned	74	68	76	53	62	74	53	56	53	52	44	64
Total freight-car mileage	40,760,922	489,000,277	143,279,169	114,694,430	114,963,786	219,083,974	22,932,296	93,440,325	32,088,657	107,762,559	77,278,147	1,455,884,533
Average miles per car per day	15.7	23.2	21.3	23.5	23.4	17.6	30.6	22.0	25.1	28.6	27.1	22.2
Per cent. loaded mileage	74.3	67.9	72.3	66.9	80.1	74.1	77.0	68.5	66.4	70.1	78.0	70.6
Ton-miles of freight, Inc. Co. freight	4,453,139,949	7,883,452,198	2,117,547,975	1,831,907,162	1,762,792,143	2,392,930,093	389,442,359	2,282,027,582	363,427,076	1,561,320,387	1,134,181,886	21,172,178,810
Average ton-miles, including Co. freight.												
Per car-mile	11.1	16.1	16.1	16.0	15.4	14.8	17.8	13.7	11.3	14.6	14.7	15.3
Per loaded car-mile	15.0	23.7	22.3	23.9	19.1	20.3	23.0	20.6	17.1	21.0	18.8	21.7
Per car per day	175	374	349	375	361	275	574	302	285	418	398	347
Gross freight earnings	$5,097,706	$45,105,848	$12,625,873	$10,713,368	$10,555,144	$19,459,851	$2,896,946	$10,151,294	$3,318,712	$12,811,108	$6,373,164	$139,109,013
Average daily earnings: per car owned	$2.16	$2.18	$1.88	$2.04	$2.11	$2.12	$5.53	$2.41	$3.92	$3.53	$2.73	$2.28
Per railroad-owned car on line	2.04	2.28	1.98	2.24	2.42	1.81	4.16	2.51	2.74	3.70	2.62	2.30
All cars on line	1.96	2.14	1.88	2.20	2.31	1.73	3.86	2.39	2.60	3.44	2.53	2.19

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF APRIL, 1910.—(See also issue of June 10.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atlanta, Birmingham & Atlantic	670	$152,404	$37,831	$203,868	$27,675	$33,899	$13,277	$83,854	$8,395	$167,100	$36,768	.....	$10,000	$26,768	$17,575
Baltimore & Ohio	4,198*	5,612,439	1,181,813	7,211,382	939,694	1,383,957	166,452	2,477,500	148,041	5,115,644	2,095,738	—66,727	242,484	1,786,527	172,751
Bangor & Aroostook	546	199,372	52,440	265,493	35,563	26,492	2,560	75,189	10,625	150,429	115,064	.....	1,500	113,564	8,517
Buffalo, Rochester & Pittsburgh	567	414,386	77,088	512,523	101,708	159,243	12,674	195,453	12,435	481,513	31,010	113	15,000	16,123	—188,725
Central of Georgia	1,916	578,018	224,307	897,840	175,269	190,299	37,164	310,166	36,417	749,315	148,525	5,116	45,200	108,441	—19,112
Chicago, Rock Island & Gulf	529	155,894	57,627	227,634	70,060	25,607	9,484	91,280	8,272	204,706	22,928	—301	8,593	14,034	—76,946
Cleveland, Cin., Chic. & St. Louis	1,982	1,481,752	565,029	2,274,959	334,369	402,686	70,677	920,774	61,672	1,790,178	484,781	—11,376	74,000	399,405	668
Duluth, South Shore & Atlantic	609	190,203	75,112	279,388	47,089	32,729	8,796	97,266	6,808	192,689	86,699	129	18,000	68,828	15,895
El Paso & Southwestern Co	901	543,832	100,854	674,681	75,572	93,566	10,724	183,144	21,430	384,436	290,245	—848	19,360	270,037	—6,882
Elgin, Joliet & Eastern	780	711,410	5	770,959	97,159	147,258	4,509	253,360	12,065	514,351	256,608	.....	22,450	234,158	16,453
Florida East Coast	583	339,143	118,445	531,617	37,699	45,621	4,659	108,532	6,654	203,165	328,452	.....	15,234	313,218	61,964
Galveston, Harrisburg & San Antonio	1,338	562,012	234,780	839,200	144,769	104,768	23,999	367,609	26,658	667,803	171,898	—1,917	28,800	140,681	—51,326
Grand Rapids & Indiana	587	275,193	108,793	415,191	61,166	86,628	12,145	166,679	18,089	344,707	70,484	86	23,674	46,896	6,796
Illinois Central	4,550	3,139,833	931,272	4,644,507	628,766	1,155,243	101,714	1,666,771	95,679	3,648,172	996,334	—3,971	204,238	788,125	14,281
International & Great Northern	1,159	460,135	147,965	652,871	109,112	111,814	18,628	332,181	22,570	594,305	58,566	.....	20,000	38,566	—12,021
Lake Erie & Western	886	325,620	58,793	408,128	77,079	76,881	13,971	155,987	11,410	335,328	72,800	.....	19,250	53,550	26,206
Lake Shore & Michigan Southern	1,663†	2,517,799	779,955	3,770,324	619,321	584,477	90,878	1,434,882	79,619	2,809,177	961,147	—5,669	135,000	820,473	—117,067
Long Island	390	288,891	440,226	764,156	103,821	112,289	14,093	334,903	22,646	587,752	176,404	51,204	33,232	194,376	28,194
Michigan Central	1,746	1,587,747	532,677	2,378,802	320,395	298,274	59,529	921,627	38,402	1,638,227	740,575	—5,618	113,000	621,957	78,553
Nashville, Chattanooga & St. Louis	1,230	717,837	188,503	970,625	155,630	172,409	32,439	348,603	24,244	733,325	237,300	—915	21,971	214,414	—529
New York Central & Hudson River	3,588	4,563,165	2,220,082	7,669,642	1,028,558	1,260,811	182,670	2,939,546	227,741	5,639,326	2,030,316	—56,259	364,451	1,609,606	—368,130
New York, Chicago & St. Louis	558	789,837	131,928	956,307	39,435	151,836	45,710	337,750	17,710	646,441	309,866	—2,604	27,000	280,262	40,673
New York, Ontario & Western	546	607,767	87,199	730,413	81,364	106,641	11,920	261,187	14,111	465,223	265,190	—5,255	20,000	239,935	36,147
Norfolk & Western	1,951	2,698,750	300,982	3,085,330	374,469	516,543	44,207	872,663	69,289	1,877,171	1,208,159	—1,087	92,800	1,114,272	254,119
Northern Central	467	842,362	161,741	1,061,233	79,089	207,125	15,040	468,910	22,769	792,933	268,300	404	24,709	243,995	1,032
Oregon R. R. & Nav. Co	1,476‡	918,334	320,723	1,328,725	225,508	134,558	32,537	420,852	30,826	844,281	484,444	—4,707	56,036	423,701	41,952
Oregon Short Line	1,508§	1,331,090	418,031	1,877,972	243,009	158,086	21,084	391,963	30,815	844,957	1,033,015	—637	55,491	976,887	124,335
Philadelphia & Reading	1,024	3,271,194	601,480	4,047,886	378,203	617,967	37,149	1,198,047	71,258	2,302,624	1,745,262	85,400	75,164	1,755,498	319,600
St. Louis & San Francisco	4,726	2,055,768	738,434	3,000,096	390,928	389,931	90,513	1,127,724	82,147	2,081,243	918,853	.....	122,458	796,395	—206,896
St. Louis Southwestern	773	440,624	94,590	561,638	101,925	98,030	24,557	141,614	22,224	388,351	173,287	—1,296	23,818	148,173	20,804
St. Louis Southwestern of Texas	703	175,888	59,137	257,931	88,491	74,137	8,253	127,148	16,896	314,925	—56,994	—278	8,333	—65,605	14,293
Seaboard Air Line	3,013	1,256,724	355,064	1,815,481	240,425	242,612	56,295	581,321	49,786	1,170,439	645,042	—1,980	67,765	575,297	162,059
Southern Pacific Co.—Pacific System	6,070‖	4,556,880	2,713,829	7,797,494	1,167,040	1,052,851	149,963	2,056,375	215,919	4,642,149	3,155,800	—13,524	280,059	2,862,217	43,601
Texas & New Orleans	458	194,479	78,223	289,664	52,758	44,928	5,877	120,401	8,829	232,793	56,871	348	11,835	45,384	12,709
Wabash	2,515	1,490,223	547,686	2,224,979	376,108	425,815	73,207	926,508	63,407	1,865,045	359,934	—3,967	75,538	280,429	—81,180
Yazoo & Mississippi Valley	1,370	542,846	165,491	754,727	199,399	137,653	16,634	258,602	21,531	633,819	120,908	2,579	34,930	88,557	48,226
TEN MONTHS OF FISCAL YEAR, 1910.															
Atlanta, Birmingham & Atlantic	670	1,631,524	430,109	2,181,596	266,944	338,435	123,449	853,456	86,430	1,668,714	512,862	.....	103,265	409,617	130,362
Baltimore & Ohio	4,198*	56,062,861	11,577,395	71,513,845	9,045,660	13,383,908	1,497,504	23,790,798	1,331,676	49,049,546	22,464,299	—507,912	1,976,964	19,979,423	2,450,774
Bangor & Aroostook	546	1,864,595	542,300	2,531,521	368,544	283,408	28,245	698,312	106,184	1,484,693	1,046,828	.....	15,000	1,031,828	159,456
Buffalo, Rochester & Pittsburgh	567	6,156,081	816,328	7,286,727	852,043	1,552,239	96,653	2,061,549	129,919	4,692,402	2,594,325	1,026	136,000	2,459,351	821,119
Central of Georgia	1,916	6,923,815	2,533,875	10,363,691	1,518,625	1,652,538	309,262	3,091,617	414,159	6,986,201	3,377,490	56,998	476,957	2,957,530	398,827
Chicago, Rock Island & Gulf	529	1,819,643	624,507	2,574,255	480,363	207,715	71,123	939,846	85,567	1,784,614	789,641	—2,543	65,595	721,503	26,246
Cleveland, Cin., Chic. & St. Louis	1,982	16,310,746	6,147,266	24,611,298	2,736,965	4,066,992	792,080	9,254,500	491,712	17,342,249	7,269,049	—68,648	730,328	6,470,072	1,623,363
Duluth, South Shore & Atlantic	609	1,752,466	804,796	2,701,054	406,281	293,864	89,278	985,169	67,027	1,841,619	859,435	6,517	188,146	677,806	—127,311
El Paso & Southwestern Co	901	4,901,915	887,055	6,071,890	833,770	812,734	100,932	1,657,428	227,481	3,632,345	2,439,545	—8,717	201,251	2,229,577	896,534
Elgin, Joliet & Eastern	780	7,163,649	157	7,762,762	756,269	1,491,880	42,113	2,399,689	150,999	4,840,950	2,921,812	.....	124,735	1,007,611	264,168
Florida East Coast	583	1,444,161	1,119,948	2,948,337	364,079	405,083	55,942	909,004	81,884	1,815,992	1,132,346	.....	292,908	2,221,563	—28,093
Galveston, Harrisburg & San Antonio	1,338	6,243,387	2,178,964	8,864,356	1,253,156	1,247,041	253,917	3,302,088	271,775	6,327,977	2,536,379	—21,908	221,478	874,799	22,675
Grand Rapids & Indiana	587	2,611,907	1,379,889	4,274,249	516,710	708,304	108,879	1,703,490	138,298	3,175,681	1,098,568	—2,291	2,150,832	10,467,235	—13,040
Illinois Central	4,550	32,781,429	9,883,332	48,645,715	6,309,141	11,219,374	1,050,400	16,440,601	973,310	35,992,826	12,652,889	—34,821	212,000	1,172,488	—78,742
International & Great Northern	1,159	5,181,259	1,617,903	7,251,130	1,200,408	1,201,334	193,106	3,056,164	215,630	5,866,642	1,384,488	.....	183,445	1,133,414	586,793
Lake Erie & Western	886	3,672,496	701,805	4,609,437	624,142	811,806	128,754	1,622,771	105,105	3,292,578	1,316,859	.....	1,248,905	13,562,024	2,139,926
Lake Shore & Michigan Southern	1,663†	26,958,216	8,900,565	40,347,754	4,823,524	5,981,643	950,929	13,065,539	657,464	25,479,099	14,868,655	—57,726	332,324	2,409,669	638,792
Long Island	390	2,549,019	4,695,449	7,591,407	837,627	1,043,372	144,851	3,292,957	191,782	5,510,589	2,080,818	661,175	993,532	6,909,434	1,385,970
Michigan Central	1,746	16,050,110	5,743,661	24,064,817	2,965,905	3,123,600	674,913	3,942,362	416,491	16,123,271	7,941,546	—38,580	209,413	2,434,561	292,530
Nashville, Chattanooga & St. Louis	1,230	6,869,018	2,140,359	9,604,447	1,452,252	1,596,464	357,088	3,316,028	229,915	6,951,748	2,652,699	—8,725	3,721,199	19,366,906	2,251,012
New York Central & Hudson River	3,588	47,441,081	24,376,868	80,065,763	10,444,248	13,446,365	2,041,084	29,327,043	1,848,949	57,107,689	22,958,074	130,031	306,109	3,042,816	918,233
New York, Chicago & St. Louis	558	7,626,764	1,204,194	9,136,437	720,412	1,005,530	468,274	3,437,532	140,891	5,772,639	3,363,798	—14,872	170,000	1,955,572	—34,494
New York, Ontario & Western	546	5,410,627	1,340,995	7,032,938	871,508	1,083,974	116,048	2,632,602	164,342	4,868,474	2,164,464	—38,892	875,200	10,954,349	2,320,373
Norfolk & Western	1,951	24,831,034	3,265,674	29,009,257	2,970,719	4,885,418	445,529	8,275,566	591,951	17,169,183	11,840,074	—10,525	247,084	2,172,600	378,471
Northern Central	467	8,342,358	1,757,635	10,680,663	1,200,258	2,072,915	136,859	4,636,185	221,777	8,267,994	2,412,669	7,015	553,662	4,610,559	—203,845
Oregon R. R. & Nav. Co	1,476‡	8,127,268	3,539,169	12,414,900	1,515,106	1,137,558	296,052	3,972,736	320,923	7,242,375	5,172,525	—8,304	587,768	8,892,493	686,635
Oregon Short Line	1,508§	11,958,403	4,294,561	17,283,617	1,790,936	1,629,517	264,280	3,796,404	318,264	7,799,401	9,484,216	—3,955	737,959	14,133,617	1,448,737
Philadelphia & Reading	1,024	29,321,223	5,871,484	36,752,916	2,766,831	7,274,155	374,989	11,058,180	627,549	22,101,704	14,651,212	220,364	1,176,553	9,175,612	299,537
St. Louis & San Francisco	4,726	22,306,933	8,420,084	33,086,180	4,737,385	4,779,488	813,825	11,441,706	961,611	22,734,015	10,352,165	.....	210,445	2,376,224	400,319
St. Louis Southwestern	773	4,838,077	1,119,284	6,217,423	870,813	905,165	251,705	1,274,063	220,208	3,621,954	2,595,469	—8,800	88,602	—119,302	—8,145
St. Louis Southwestern of Texas	703	2,152,794	719,238	3,090,628	851,323	681,044	95,401	1,334,370	157,081	3,119,219	—28,591	—2,109	612,875	5,227,343	1,282,428
Seaboard Air Line	3,013	11,587,999	3,604,609	16,782,685	2,279,528	2,275,285	578,969	5,287,682	499,356	10,920,820	5,861,865	—21,647	2,560,606	32,751,587	5,816,166
Southern Pacific Co.—Pacific System	6,070‖	47,311,372	26,348,002	78,804,044	9,511,821	9,988,065	1,307,191	20,575,003	2,019,545	43,401,625	35,402,419	—90,226	123,635	725,396	202,759
Texas & New Orleans	458	2,150,202	824,048	3,162,394	489,197	492,056	60,590	1,185,777	89,648	2,325,268	837,126	11,905	700,248	6,583,407	1,291,111
Wabash	2,515	16,439,891	5,846,750	24,138,762	2,897,483	3,347,675	765,790	9,145,981	673,994	16,830,923	7,307,839	—24,184	700,248	6,583,407	1,291,111
Yazoo & Mississippi Valley	1,370	5,972,449	1,877,529	8,410,726	1,722,476	1,536,033	165,058	2,758,938	236,207	6,418,712	1,992,014	25,251	356,160	1,661,105	395,658

*Mileage operated on April 30, 1909, 3,992 miles. †Mileage operated on April 30, 1909, 1,511 miles. ‡Mileage operated on April 30, 1909, 1,327 miles. §Mileage operated on April 30, 1909, 1,456 miles. ‖Mileage operated on April 30, 1909, 5,598 miles. —Indicates Deficits, Losses and Decreases.

INTERSTATE COMMERCE COMMISSION.

No Obligation to Publish Combinations of Local Rates (in Lieu of Through Rates).

Canadian Valley Grain Company v. Chicago, Rock Island & Pacific et al. Opinion by Commissioner Cockrell.

In the absence of a joint rate from a local station on the line of one carrier to a point on the line of another carrier, it is not incumbent upon initial carrier to post at point of origin tariffs showing combination of local rates applicable to the shipment. Reparation, claimed because of failure so to post, denied.

Through Route Refused: Good One Already Available.

Spring Hill Coal Company v. Erie Railroad et al. Opinion by Commissioner Cockrell.

Complaint for the establishment of through route and joint rate over certain lines dismissed because of the existence over other lines of a "reasonable through route." The complainant has coal mines at Jermyn, Pa., on the lines of defendants, Delaware & Hudson and New York, Ontario & Western railways, and desires to ship coal to points in New York via Carbondale, Pa. Defendants refuse to establish a through route and joint rate. Each of the three defendants filed separate answers denying the material averments of the complaint and asserting that there is a through route and joint rate over the lines of the Delaware & Hudson to Wilkesbarre and thence by the Pennsylvania Railroad. Subsequent correspondence culminated in a letter from complainant expressing a desire to have the case dismissed. An order was entered accordingly. (18 I. C. C., 508.)

Definition of Chains.

Woodward, Wight & Co. v. Chicago, Burlington & Quincy et al. Opinion by Commissioner Clark.

Under southern classification there is a rate of 41 cents per 100 lbs. on machinery, conveyor chains, sprocket chains, etc., from East Moline, Ill., to New Orleans, La. At the time the shipment in question was made there was a special commodity rate between East Moline and New Orleans on "chains" "packed" in carloads of 26 cents. The shipment in question consisted of iron conveyor chains and sprocket chains. These chains were shipped in carloads and were riveted together in bundles but were not packed in the sense that they had any form of outside covering. The railway classified the shipments as machinery and charged 41 cents. The complaint says that they should have been classified as "chains packed" and a charge of only 26 cents made. It is evident that these sprocket chains are used for an entirely different purpose and are of much greater value than the ordinary chain of commerce, and we would not be justified in separating this part of machinery from the general machinery rate unless at the same time we separated various other portions of the completed machine when such parts moved separately. The complaint is dismissed. (18 I. C. C., 500.)

Voluntary Rate Reduction By Carrier Not Proof of Unreasonableness of Former Rate.

Sunderland Brothers v. Chicago, Burlington & Quincy et al. Opinion by Commissioner Cockrell.

Rate of $3.75 per net ton on soft coal from Peoria, Ill., to Ainsworth and Valentine, Neb., not found unreasonable. Reparation denied. There were shipped from Christopher, Ill., to complainant at Ainsworth and Valentine, Neb., 14 carloads of soft coal, weighing in the aggregate 815,300 lbs. The shipments moved over the Chicago, Burlington & Quincy to Peoria, and thence over the Chicago & North Western. Valentine and Ainsworth are both located on the North Western line and are respectively 781.7 miles and 735 miles from Peoria. The distances from Christopher to Valentine and Ainsworth over the route the traffic moved are respectively 971 and 924 miles.

Through rates from Christopher to Ainsworth and Valentine were $4.10 and $4.25, respectively.

Complainant's case consists largely of statements of comparisons on a ton-mile basis of rates from Peoria to Valentine and Ainsworth with rates on coal from Peoria, Manitowoc, Chicago and East St. Louis to other points on defendants' lines, but there is nothing in the record upon which a conclusion can be reached respecting the value of the comparisons made. The revenue per ton per mile accruing to the North Western, which is the part complained of, is 4.8 mills on shipments to Valentine and 5.1 mills on shipments to Ainsworth. Rates on this traffic which yield about 5 mills per ton per mile in the territory involved we are unable to find are unreasonable. The voluntary reduction of a rate by a carrier is not of itself such a proof of the unreasonableness of the former rate as to form a proper basis for an award of reparation. (18 I. C. C., 512.)

STATE COMMISSIONS.

The State Railroad Commission of Missouri has called upon the railways to appear at Jefferson City July 6 to show reasons, if any they have, against a proposed reduction of about 15 per cent. in freight rates. The proposed reductions apply to wheat, corn and oats in carloads, and to the general mileage rates on merchandise, so far as these rates can be changed

REVENUES AND EXPENSES OF EXPRESS COMPANIES.

FOR THE MONTH OF FEBRUARY, 1910.
(Reported to the Interstate Commerce Commission.)

Name of company.	Adams Express.	American Express.	Canadian Express.	Can. Nor. Express.	Globe Express.	Great Nor. Express.	National Express.	Northern Express.	Pacific Express.	Southern Express.	United States Express.	Wells, Fargo & Co.	Western Express
Mileage of all lines covered: Rail lines	31,179	46,409	7,362	3,198	1,900	7,325	1,094	6,569	22,319	31,288	30,094	50,346	3,506
Other lines	3,372	1,004	2,792	22	.....	211	.....	261	608	1,648	611	4,994	4
Operating revenues:													
Express	$2,175,282	$2,387,557	$141,086	$22,179	$33,367	$152,494	$70,673	$198,356	$565,698	1,055,356	$1,272,319	$1,733,406	$34,522
Misc. transportation	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	103	135
Nontransportation	12,465	89,170	3,421	1,096	458	971	335	2,686	8,099	15,989	20,185	31,852	643
T'l receipts operation	2,187,747	2,476,727	144,507	23,274	33,824	153,466	71,008	201,041	573,786	1,071,345	1,292,503	1,765,361	35,300
Exprs. privileges—Dr.	1,145,751	1,151 748	73,998	8,871	16,659	61,655	23,947	95,718	277,957	508,925	613,870	836,549	21,918
Total	$1,041,996	$1,324,979	$70,509	$14,403	$17,165	$91,810	$47,061	$105,324	$295,828	$562,420	$678,633	$928,812	$13,382
Operating expenses:													
Maintenance	$46,540	$123.925	$1,827	$5	$630	$726	$555	$795	$9,211	$14,755	$31,600	$38,640	$463
Traffic	4,605	21,339	904	346	1,056	728	.....	3,221	6,130	6,798	11,390	15,100	1,299
Transportation	896,357	1,141,527	63,306	8,574	13,244	47,638	38,439	63,848	204,839	357,386	661,421	733,878	17,655
General	72,448	112,236	6,771	1,251	2,971	3,484	2,824	4,556	13,520	49,614	41,858	69,954	2,499
Total	$1,019,949	$1,399,027	$72,809	$10,176	$17,900	$52,576	$41,818	$72,421	$233,700	$428,553	$746,269	$857,571	$21,916
Net operat'g rev. or def.	$22,046	*$74.048	*$2,299	$4,277	*$735	$39,234	$5,243	$32,903	$62,128	$133,866	*$67,636	$71,241	*$8,534
Taxes	14,197	11,818	1,150	130	500	2,457	35	3,500	4,948	9,886	5,871	20,582	371
Operating inc. or loss.	$7,849	†$85,866	†$3,450	$4,096	†$1,235	$36,777	$5,207	$29,403	$57,180	$123,981	†$73,507	$50,659	†$8,904

* Net operating deficit. † Operating loss.

without violating the federal injunction now pending in the United States supreme court.

The Railroad Commission of Louisiana, in ordering a reduction of class and commodity rates between Winnfield and other Louisiana points, says that it has been the custom of the commission in adjusting rates from jobbing centers where competition is severe to apply the principle of equal rates for equal distances, and this rule seems to have resulted, says the commission, in satisfactory adjustments, especially in North Louisiana territory where competition is extremely active and jobbing centers numerous.

The Railroad Commission of Louisiana has ordered the rates on rough oak staves reduced. Under the present adjustment of rates the same rates apply on rough oak staves as apply on barrel staves and heading between points in Louisiana. It has been shown that on a certain carload of rough oak staves shipped from Morganza, on the Texas & Pacific, to New Orleans, the freight amounted to $52 per car, while the proceeds from the sale of the staves amounted to $89—the freight being nearly 60 per cent. of the value of the contents of the car. The reduction ordered varies from 1 cent to 3 cents per 100 lbs.

The State Railroad Commission of New Jersey, after hearing testimony from officers of the principal roads, decided this week to proceed to revalue the property of the principal roads in the state, with a view to inquiring into the justice of the increases in rates which have been announced to go into effect July 1. This action follows complaints concerning increased commutation fares to New York City, which are interstate and, of course, are not subject to the authority of the state commission. Some intrastate were increased, it appears. The railways are called upon for full information concerning their taxes for the past five years.

COURT NEWS.

The New York State court of appeals has sustained the law of that state requiring railways to pay their employees' wages twice a month. The suit was brought by the New York Central and the Erie, and the decision is by Judge Bartlett.

A press despatch says that the suit of the Michigan Central against the state of Michigan for damages on account of abrogating the road's special charter, and the suit of the state against the road for back taxes have been settled by the payment to the state by the railway company of $125,000.

In the United States supreme court at Guthrie, Okla., June 10, a temporary injunction was issued against the enforcement of the Oklahoma 2-cent passenger fare law and the maximum freight rate law. The complaint was made by the Rock Island and the St. Louis & San Francisco, and it is said that these roads will at once re-establish 3-cent passenger fares. The Santa Fe and the M., K. & T. had already obtained similar injunctions.

In the federal court at Chicago, June 11, the petition of the Pullman Company for an injunction to restrain the enforcement of reduced rates for berths, as recently ordered by the Interstate Commerce Commission, was denied. This decision covers also the petition of the Great Northern Railroad, both petitioners being advised to go to the commission for a rehearing. The decision was oral and was given by Judge Grosscup, Judges Baker and Seaman concurring. The court held that the Pullman Co. had failed to show that it would suffer any injury by the order. Plaintiffs were censured for bringing before the court evidence which had not been presented to the Interstate Commerce Commission. The motion was denied without prejudice.

"The long-cherished wish" of delegates to the Prussian Diet for free passage during the session between Berlin and their homes has at last been gratified. They seem not to have ventured to think of "unlimited free passes on all lines, good for the year," much less of passes for members of their families.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

T. W. R. McRae has been appointed claim agent of the Grand Trunk, with office at Montreal, Que., succeeding Sibthorp Wells, deceased.

The directors of the St. Louis, Brownsville & Mexico at the annual meeting elected the following officers: Chairman, B. F. Yoakum; president, B. L. Winchell; first vice-president, Albert T. Perkins; second vice-president, Carl E. Gray; third vice-president, R. J. Kleberg; secretary, J. B. Finnigan; auditor, O. H. Nance; general manager, C. B. Rogers.

A. D. Bethard, who was recently appointed vice-president and general manager of the Missouri, Kansas & Texas of Texas, was born October 24, 1857, in Bushnell, Ill. He entered railway service in 1873 on the Rockford, Rock Island & St. Louis, where he served as a telegraph operator until 1876. He subsequently held positions as telegraph operator, agent, despatcher, chief despatcher and trainmaster of the St. Louis, Iron Mountain & Southern, and in 1881 he became trainmaster and superintendent of telegraph of the Richmond & Allegheny. In 1888 he accepted service with the Missouri, Kansas & Texas and has remained continuously with this system to the present, holding positions as trainmaster, superintendent, superintendent of transportation, assistant general manager and vice-president and general manager, his present position.

Joseph M. Bryson, who has been appointed general solicitor in charge of litigation of the Missouri, Kansas & Texas, with office at St. Louis, Mo., was born in Pittsburgh, Pa., March 26, 1867. When very young he moved with his parents to Missouri, where he attended the public schools and the State Normal School, graduating from the latter in 1887 with a degree of Ph.D. He entered the law offices of Warner, Dean & Hagerman, Kansas City, Mo., in 1887, and secured admission to the bar in 1889. In his practice he has confined his attention to civil law, specializing particularly in corporation law. He has been connected with the law department of the Missouri, Kansas & Texas for more than 20 years and has been steadily advanced to his present position. He is a member of the St. Louis, Missouri State and American Bar Association.

J. W. Mulhern, who has been appointed assistant to the second vice-president and general manager of the Western Pacific, with office at San Francisco, Cal., was born November 25, 1863, at Naples, Ill. He entered railway service in 1881 as a laborer on the Chicago, Burlington & Quincy, at Beardstown, Ill. He continued in the service of that company until 1887, working as a brakeman and later as a freight and passenger conductor. From 1887 to 1902 he was consecutively yardmaster, night trainmaster and trainmaster of the Hannibal & St. Joseph, and from 1902 to 1908 he was superintendent on the Chicago, Burlington & Quincy, consecutively in charge of the Kansas City terminals, the Hannibal division and the Galesburg division. In 1908 he became superintendent of the Chicago & Alton at Bloomington, Ill., the position he recently resigned to become assistant to the second vice-president and general manager of the Western Pacific.

Operating Officers.

F. Kinsey has been appointed inspector of transportation of the Chicago Great Western, with office at Chicago.

E. J. Wright, assistant superintendent of the Mohawk electric division of the New York Central & Hudson River, at Utica, N. Y., has been appointed assistant superintendent of the Western division, with office at Syracuse, succeeding S. J. Kearns, promoted.

Wm. Arthur Durham, who has been appointed assistant general manager of the Missouri, Kansas & Texas, with office at St. Louis, was born March 22, 1867, in Garrard County, Ky. He has been in the service of the Missouri, Kansas & Texas continuously since he first entered railway work in November 1884. He began as messenger and caller at Sedalia,

Mo., and has subsequently held positions as clerk in the superintendent's office, timekeeper, chief clerk in superintendent's office, general time-checker for the system, special accountant, supervisor of wages, assistant to general manager and assistant general manager, the position he now holds.

P. J. Lynch, who was recently appointed superintendent of the Northern division of the Grand Trunk, with office at Allandale, Ont., was promoted in 1898 from the position of passenger conductor on the Northern division of the Grand Trunk to trainmaster at Stratford, in charge of districts north of that place, and the following year he was transferred to Belleville as trainmaster, with jurisdiction between Brockville and Toronto. He returned to Stratford in 1900 as trainmaster, with jurisdiction over lines between Toronto and Sarnia, also between Buffalo and Goderich. Four years later he was appointed assistant superintendent at Allandale, which position he held at the time of his recent appointment as superintendent.

Timothy W. Evans, whose appointment as superintendent of the Buffalo division of the New York Central & Hudson River, with office at Buffalo, N. Y., was recently announced in these columns, was born July 15, 1867, at Morris Run, Tioga county, Pa. He was educated in the common schools and began railway work June 1, 1883, with the Fall Brook Railway, now a part of the New York Central & Hudson River, as a telegraph operator, at Cedar Run. In December of the same year he was transferred to Wellsboro, Pa., remaining at that place until April, 1888, when he was appointed train despatcher of the same road at Jersey Shore, and about five years later he went as train despatcher to the Beech Creek Railway, which became a part of the Pennsylvania division of the New York Central & Hudson River in 1899. He remained in that position until September, 1901, when he was appointed trainmaster of the Beech Creek district of the Pennsylvania division of the New York Central. In December, 1904, he was made chief trainmaster of the Pennsylvania division, and from January, 1906, to October of the following year he was assistant superintendent of the same division. In October, 1907, he was appointed superintendent of the Rochester division, which position he held at the time of his recent appointment as superintendent of the Buffalo division.

T. W. Evans.

Melville M. Fowler, who has been appointed superintendent of the Northern Pacific at Missoula, Mont., as previously reported in these columns, was born December 25, 1857, at Newport, Minn. He entered the service of the Chicago, Milwaukee & St. Paul in 1874 as operator, later being promoted to despatcher and chief despatcher. In 1887 he became train despatcher on the Northern Pacific, since which time he has been in the continuous service of that company. He has held positions of chief despatcher, assistant superintendent, superintendent at Minneapolis, Minn.; trainmaster and then acting superintendent at Missoula, the position he leaves to become superintendent at the same place.

John H. Jackson, who has been appointed superintendent of the St. Louis & San Francisco at Birmingham, Ala., as previously announced in these columns, was born February 28, 1869, at Terre Haute, Ind. He entered railway service October 1, 1893, as station helper on the K. C., O. & S. Ry. He later held positions as truckman and clerk in the Kansas City, Mo., freight house and agent at Kansas City. In April, 1900, the Frisco System absorbed the K. C., O. & S., Mr. Jackson retaining his position as agent. He has been continuously in the service of the Frisco System since that time, having held position as assistant trainmaster, trainmaster and assistant superintendent, from which he was promoted to superintendent.

Alva C. Elston, who has been appointed superintendent of the Buffalo division and branches of the Erie Railroad, also manager of the Union Steamboat Line, with office at Buffalo, N. Y., was born November 18, 1867, at Unionville, Orange county, N. Y. He was educated in the public schools of his native town, and began railway work in 1880 as student operator on the New York, Susquehanna & Western, controlled by the Erie. From 1881 to 1884 he was agent at various places and then for four years he was operator. From 1888 to 1902 he was despatcher and chief train despatcher. In March of the last named year he was promoted to the position of division operator on the Erie. In December, 1903, he was made superintendent of the New York, Susquehanna & Western, remaining in that position until August, 1904, when he was made superintendent of the New York division of the Erie at Jersey City. He held that position until his recent appointment.

Alva C. Elston.

Frank L. Sheppard, general superintendent of the New Jersey division of the Pennsylvania Railroad, has been appointed also general superintendent of the Pennsylvania Tunnel & Terminal Railroad, which consists of the extension to Manhattan and Long Island City, as previously announced in these columns. He retains his office at Jersey City. Mr. Sheppard was born in 1851 at Bridgeton, N. J. He entered the service of the Pennsylvania Railroad as an apprentice at the Altoona shops in 1868, and subsequently was employed as a draftsman and in charge of engineering work. Soon after the lease of the United Railroads of New Jersey to the Pennsylvania, Mr. Sheppard was transferred to that division, serving in various capacities, principally as trainmaster, on the New York division, until 1881, when he was appointed superintendent of the Sunbury division of the Philadelphia & Erie. He continued in that position but a short time, and, in 1882, he was appointed superintendent of motive power at Altoona, serving as such until 1890, when he was appointed general superintendent of the Pennsylvania Railroad division. On January 1, 1899, he was appointed general superintendent of the United Railroads of New Jersey division. The name of this grand division has since been changed to the New Jersey division.

F. L. Sheppard.

Albert Earl Clift, who has been appointed general superintendent of the southern lines of the Illinois Central, with office at New Orleans, La., as previously announced in these columns, was born October 15, 1868, at Urbana, Ill. He entered railway service December 5, 1888, as brakeman on the Illinois Central, and continued with that company as brakeman and conductor until 1892. He then served the Cleveland, Cincinnati, Chicago & St. Louis in the latter capacity for one year, returning to the Illinois Central, where he was promoted to yardmaster and later to trainmaster of the Chicago division, with office at Kankakee, Ill. He was made superintendent of the Freeport division in 1905, and of the St. Louis division in 1907, serving in the latter position until his recent appointment as general superintendent of the southern lines, with office at New Orleans, La.

Traffic Officers.

G. A. Weller has been appointed commercial agent of the Ann Arbor in charge of a new office at Pittsburgh, Pa.

W. A. Adams has been appointed agent of the Traders' Despatch at Seattle, Wash., succeeding J. W. Koester, resigned.

H. M. Adams has been appointed general freight and passenger agent of the Western Pacific, with office at San Francisco, Cal.

Harry J. New, city passenger agent of the Southern Railway, at St. Louis, Mo., has been appointed a traveling passenger agent.

Harley T. Caldwell has been appointed soliciting freight agent of the Atlanta, Birmingham & Atlantic at St. Louis, Mo., succeeding John E. Keane, resigned.

L. F. Boltz has been appointed general freight and passenger agent of the Asherton & Gulf, with office at Asherton, Tex., succeeding J. H. Jackson, resigned.

A. V. Kipp has been appointed a traveling freight agent of the Colorado division of the Union Pacific, with office at Denver, Colo., succeeding J. L. Carney, promoted.

Henry Izzard, soliciting freight agent of the International & Great Northern at Galveston, Tex., has been appointed a traveling freight agent, with office at San Antonio.

Byron H. Bullard has been appointed city passenger agent of the Harriman lines at Chicago, succeeding R. D. Williams, whose appointment as district passenger agent of the Union Pacific has been announced in these columns.

J. C. Sartelle, general agent of the Atchison, Topeka & Santa Fe at New Orleans, La., has been appointed general agent, freight department, at St. Louis, Mo., succeeding B. J. Libbe, whose resignation has been announced in these columns.

F. A. Fetter has been appointed a commercial agent of the Seaboard Air Line, with office at Wilmington, N. C., and J. D. Dawson has been appointed a soliciting freight agent, with office at Baltimore, Md., succeeding A. A. Price, resigned to go to another company.

F. H. Adams has been appointed acting general agent of the San Pedro, Los Angeles & Salt Lake, with office at Los Angeles, Cal., succeeding F. J. Wheeler, granted leave of absence. J. Cruickshank has been appointed district passenger agent at Los Angeles, Cal.

W. W. Wood, city passenger agent of the Chicago, Rock Island & Pacific at Colorado Springs, Colo., has resigned to enter private business. R. S. Torrington, district passenger agent at Detroit, Mich., succeeds Mr. Wood, and C. C. Gardner, traveling passenger agent at Davenport, Iowa, succeeds Mr. Torrington.

Robert S. Ruble, whose appointment as assistant general passenger agent of the Union Pacific, with office at Omaha, Neb., has been announced in these columns, has served the Union Pacific continuously since he entered railway work in 1891. He served nine years in the passenger department at Denver, Colo., seven years as traveling passenger agent in Utah and California, and since 1907 has been city passenger agent in Denver, Colo. He leaves this position to assume his new duties as assistant general passenger agent.

James Lee West, who has been appointed general freight agent of the Missouri, Kansas & Texas of Texas, with office at Dallas, Texas, as announced in these columns, was born August 16, 1868, at Belleville, Ill. He entered railway service February 10, 1889, as stenographer for the general roadmaster of the Missouri, Kansas & Texas. In 1893 he was made commercial agent of this company, and subsequently held positions as chief clerk in the general freight offices, assistant freight agent and general freight agent. He resigns the latter position to assume his new title.

Guy S. McCabe, who has been appointed general western freight agent and division freight agent of the Chicago terminal division of the Pennsylvania Co., was born July 23, 1873, at Sewickley, Pa. He entered railway service Nov. 1, 1889, as clerk in the general freight office of the Pittsburgh, Cincinnati & St. Louis, and in 1896 he was made traveling freight agent of the Pittsburgh, Cincinnati, Chicago & St. Louis. He later held the position of division freight agent of the same company, and since April 1, 1908, he has been general western and division freight agent of the Pennsylvania Co. at Chicago.

J. W. Allen, whose appointment as general freight agent of the Missouri, Kansas & Texas, with office at St. Louis, Mo., has been announced in these columns, was born July 28, 1855, in Cole county, Mo. He entered railway service September 7, 1880, as bill of lading clerk with the Blue Line at St. Louis. He served a number of companies in clerical positions until 1887, when he was appointed general agent of the Texas & St. Louis, at Memphis, Tenn. He remained with this company until his appointment as assistant general freight agent of the Missouri, Kansas & Texas in November, 1888. About three years later he was promoted to general freight agent, and in 1893 became general freight agent of the Missouri, Kansas & Texas of Texas, the position he leaves to become general freight agent of the Missouri, Kansas & Texas, with office at St. Louis.

William Borner, who has been appointed assistant to the freight traffic manager of the Pennsylvania Lines West, with office in Chicago, as previously announced in these columns, was born March 27, 1842, at Bedford, Pa. He took a course in bookkeeping in Duff's Commercial College, and entered railway service January 1, 1857, with the firm of Leech & Co., agents and forwarders of through freight over the Pittsburgh, Fort Wayne & Chicago, now a part of the Pennsylvania System. He served the Union Line as chief clerk and cashier, and was appointed local agent of the Pennsylvania Co. in Chicago July 1, 1877. Since that date he has been in continuous service of this company, serving as general western and division freight agent since June, 1881. He leaves the latter position for the new one of assistant to the freight traffic manager, with office in Chicago.

S. P. Howard, general freight agent of the Eastern and Lake Superior divisions of the Canadian Pacific, having resigned to engage in other business, H. E. Macdonell, general freight agent, Atlantic division, at St. John, N. B., has been appointed general freight agent of the Eastern division, in charge of Chalk River, Ont., and the territory east of that place, also from Smith Falls to Newport, Megantic and Quebec, including branch lines, with office at Montreal, Que.; W. S. Elliot has been appointed general freight agent of the Lake Superior division, in charge of Chalk River and territory west to Sault Ste. Marie and Port Arthur, not including the lines south of Romford junction, with office at North Bay, Ont. W. B. Bamford, district freight agent at London, Ont., has been appointed general freight agent of the Atlantic division, with office at St. John, succeeding H. E. Macdonell, and L. Mulkern has been appointed a district freight agent, with office at London, succeeding W. B. Bamford.

Edward S. Briggs, whose appointment as assistant general freight agent of the Missouri, Kansas & Texas, with office at St. Louis, Mo., has been announced in these columns, was born October 25, 1872, at Indianapolis, Ind. He entered railway service in 1888 as messenger boy in the local freight department of the Texas & Pacific at Dallas, Tex. He was advanced in clerical positions with this company until 1893, when he resigned to become yard clerk in the local freight department of the Missouri, Kansas & Texas, at Dallas, Tex. In 1895 he went to New Orleans, La., as chief bill clerk of the Texas & Pacific, returning the next year to the local freight department of the Missouri, Kansas & Texas at Dallas. He served in various positions until 1898, when he was trans-

ferred to the general freight department, in which he subsequently held the positions of freight clerk, cotton clerk, chief rate clerk, chief clerk and assistant general freight agent at Houston, Tex., the position he held until his appointment as assistant general freight agent at St. Louis, Mo.

Engineering and Rolling Stock Officers.

H. S. Needham has been appointed assistant engineer of motive power of the Pennsylvania Lines West, succeeding C. D. Young, transferred.

S. D. Warren, signal inspector on the Chicago, Milwaukee & Puget Sound, has been appointed assistant signal engineer, with office at Tacoma, Wash.

John Leisenring, assistant engineer, road and track, of the Hudson & Manhattan, has been appointed signal engineer, with office in New York.

E. J. Robertson has been appointed superintendent car department of the Minneapolis, St. Paul & Sault Ste. Marie, succeeding I. G. Pool, deceased.

R. H. Howard, whose resignation as engineer maintenance of way of the Chicago & Eastern Illinois has been announced in these columns, will enter private business in New York.

F. J. Bauman, assistant supervisor of signals of the Pennsylvania Railroad, at Harrisburg, Pa., has been appointed supervisor of signals of the Renovo division, at Renovo, Pa.

M. J. Carrigan has been appointed district foreman of the Oregon Short Line and the Southern Pacific lines east of Sparks, Nev., succeeding W. E. White, assigned to other duties.

H. Rindal, assistant engineer of the Canadian Pacific at Winnipeg, Man., has been appointed engineer of the Pacific division, with office at Vancouver, B. C., succeeding C. E. Cartwright, resigned.

A. R. Ayers, whose appointment as mechanical engineer of the Lake Shore & Michigan Southern was recently announced in these columns, has been appointed also mechanical engineer of the Chicago, Indiana & Southern and the Indiana Harbor Belt.

L. C. Hartley, whose appointment as engineer maintenance of way of the Chicago & Eastern Illinois, with office in Chicago, has been announced in these columns, was born December 29, 1871, near Morgantown, W. Va. He attended the Ohio State University from 1896 to 1898 and entered railway service in August, 1898, as signal repairman on the Pittsburgh division of the Pittsburgh, Cincinnati, Chicago & St. Louis. He remained with this company until September, 1907, holding positions on the engineering corps and later as assistant engineer maintenance of way. Since September, 1907, he has been signal engineer of the Chicago & Eastern Illinois, the position from which he is now promoted to engineer maintenance of way.

Special Officers.

H. M. Cottrell has been appointed agricultural commissioner of the Rock Island Lines, with office in Chicago.

OBITUARY.

I. G. Pool, superintendent of the car department of the Minneapolis, St. Paul & Sault Ste. Marie, died at his home in Minneapolis June 6. Mr. Pool was 66 years of age and had been in the service of the company for 22 years.

Elisha P. Wilbur, former president of the Lehigh Valley, died at Alexandria Bay, Thousand Islands, N. Y., on June 4, at the age of 77. Mr. Wilbur was born at Mystic, Conn. He went to Mauch Chunk, Pa., in 1852, and helped to make the first surveys of the Lehigh Valley road. He was intimately associated with Judge Asa Packer, one of the principal owners of the Lehigh Valley and allied properties, and was an executor of his estate. Mr. Wilbur's interests embraced not only the Lehigh Valley Railroad and its affiliated properties, but also large iron and coal interests, including the Wilbur Coke Co., owning extensive lands in West Virginia. He was a trustee of Lehigh University. He is survived by a widow and seven sons. One of these, Rollin H., of Philadelphia, was for several years general manager of the Lehigh Valley.

Railway Construction.

New Incorporations, Surveys, Etc.

ALABAMA ROADS.—Surveys are being made and rights-of-way secured for the line projected from Decatur, Ala., southwest to Falls City, about 50 miles. E. H. Allison, New Decatur, may be addressed. (June 10, p. 1436.)

ALASKA ROADS.—Survey is to be started soon for a line to be built from Controller bay, Alaska, into the Bering river coal fields in Alaska, about 22 miles. H. White, president, Los Angeles, Cal., and C. A. L. Alisky, Portland, Ore., is also interested.

ALLIANCE & AKRON SHORT LINE.—An officer writes that a contract has been given to the B. & M. Engineering & Construction Co., Cleveland, Ohio, to build this line. The projected route is from Alliance, Ohio, northwest via Marlboro, New Baltimore, Congress Lake, Logtown and Magadore to Akron, about 26 miles. Construction work will be started soon, and some of the work will probably be sublet. Charles S. Kieth, president, Alliance, and L. C. Marble, chief engineer, 1005 Schofield building, Cleveland.

BOISE & WESTERN.—This company, which was originally promoted by C. E. S. Wood and William Hanley, Burns, Ore., has made application to the government for permission to build through government lands in Oregon along the Malheur valley to the eastern part of Harney county. A promoter writes that right-of-way was secured up the Malheur canyon to a point where it enters Harney valley, 120 miles from Vale. After securing the right-of-way it was turned over to the Hill lines. As the government is willing to grant permission to the company to build that line only on condition that the tracks shall be taken up and removed at any time the government may demand the use of the canyon for water power or reservoir sites, the line will not be built. (Feb. 11, p. 329.)

BOSTON & ALBANY.—The proceeds of the $2,000,000 of bonds which this company has asked permission to issue are to be used for improvements already finished or to be completed during 1910, as follows: Grand Junction Railroad, third-tracking and additional main tracks, $168,000; East Cambridge, Mass., developing delivery yard, $50,000; Chelsea, new freight house, $6,500; Worcester, elimination of grade crossing and new passenger station, $400,000; four-tracking layout, South Worcester, $315,000; signals and interlocking, $331,000; bridge renewals, $250,000; third-tracking and additional main tracks connecting third track between East Greenbush, N. Y., and Rensselaer, $125,000; passing tracks and sidings at West Brookfield, Mass., Westfield, Washington, Canaan, N. Y., State Line, Mass., and East Chatham, N. Y., $49,000; engine facilities at Beacon Park, Mass., West Springfield, North Adams Junction, Hudson, N. Y., and North Adams, $43,200; enlarging team delivery yard at Natick, Mass., $5,000; team and coach yard at South Framingham, $35,000; 60-car yard at Westfield, $10,000; widening track centers and additional two-track tunnel for eastbound main tracks at State Line, $150,000, and buildings at West Springfield, Becket and Westboro, $34,000. The balance of $28,300 is to be expended for miscellaneous permanent improvements of a like nature. (May 6, p. 1183.)

BUTTE & PLUMAS.—Incorporated in California, with $500,000 capital, to build from Oroville, Cal., northeast to Stanwood, about 25 miles. The incorporators include: O. C. Haslett, Alameda; E. S. Dunbar and J. L. Smith, Oroville.

CHICAGO, MILWAUKEE & ST. PAUL.—It is said that this company will double-track its entire Hastings and Dakota division from Minneapolis, Minn., across Minnesota to the South Dakota line.

CRYSTAL CITY & UVALDE.—This company, which operates a line from Uvalde Junction, Tex., south to Crystal City, 41 miles, is said to have part of the work finished on an extension being built to Gardendale, about 40 miles. It is said the company proposes to begin work next month on a further extension from Gardendale southeast either to Corpus Christi or Aransas Pass. Work is said to be under way putting up shops and a roundhouse at Crystal Springs, Tex.

CUBA RAILROAD.—An officer is quoted as saying that this

company will finish extensions in Cuba, totaling 180 miles, during the next six weeks, connecting the port of Manzanillo with inland points. (Oct. 29, p. 827.)

Fairchild & North Eastern.—Capital is said to have been secured and surveys have been made for building an extension from Fairchild, Wis., west to Caryville, about 40 miles. The line is now in operation from Fairchild northeast via Greenwood to Owen, 38 miles.

Fort Smith, Subiaco & Eastern.—This company has been granted permission in Arkansas to extend its line from Subiaco, Ark., via Scranton to Dardanelle, 23 miles. The line is now in operation for about six miles from Paris to Subiaco.

Georgia & Florida.—This company is said to have bought land recently to be used as a right-of-way for an extension of its tracks to its terminal property in Augusta, Ga.

Grand Trunk.—The Massachusetts Railroad Commission has been petitioned to permit the Grand Trunk to build under the name of the Southern New England Railroad the section of its proposed extension from Palmer, Mass., southeast via Monson, Brimfield, Sturbridge, Dudley, Webster and Uxbridge, to Blackstone, about 54 miles, at an estimated cost of $3,500,000. The board held a public hearing on this petition June 7. Consent has already been granted by Rhode Island to extend the line from the Massachusetts border south to tidewater at Providence. (April 22, p. 1066.)

Kansas City, Tulsa & Southwestern.—At a recent meeting of this company it was decided to build from Joplin, Mo., southwest to Tulsa, Okla., about 105 miles. It is said that financial arrangements have been made and construction work will be started soon. Col. C. H. Lynch, president.

Mississippi Roads (Electric).—Franchises have been granted to W. D. Bullard and associates by the town of Scranton, Miss., and other towns to build an electric line connecting Pascagoula, Scranton, Moss Point and Orange Grove, thence east to the Alabama state line.

Monongahela Railroad.—See Pennsylvania Roads.

Naples & Northwestern.—Incorporated in Texas, with $100,000 capital and headquarters at Naples. The plans call for a line from Naples to Sylvania, in Titus county, about 25 miles. The incorporators include: F. T. Atkinson, Cincinnati, Ohio; F. Stacke, J. H. Conley and C. B. Todd, Naples.

Newton Northwestern.—Organized to build from Newton, Miss., northwest via Conchatta and Walnutgrove to Carthage, about 45 miles. Surveys have not yet been made but the promoters expect to ask bids for the work about October 1. D. L. Raglan, president, Newton.

New York, New Haven & Hartford.—The borings through Sylvan hill, in Terryville, Conn., for the tunnel which is to shorten the Willimantic-Poughkeepsie line by about a mile and a half, are about finished. The tunnel will be 3,850 ft. long, and it is expected will be ready for traffic by November 1. (Dec. 17, p. 1214.)

Norfolk & Western.—According to press reports, important double-tracking work is now being carried out between Vivian, W. Va., and Huger, on three sections, a total of about 6.5 miles. The improvements include piercing several tunnels and the work will eliminate a number of curves. The company is said to be making plans to build a new line from Berwind, at the southern end of the Jaeger-Southern branch, southeast to the Clinch Valley line near Tazewell, Va. Extensive improvements are also said to be planned on the Ohio end of the line between Columbus and Kenova, to include double-tracking work and reducing grades and curves.

Nueces River Valley.—An officer is quoted as saying that contracts were let recently for building the first 60 miles of this line. The projected route is from Beeville, Tex., west via Caruso Springs to Eagle Pass, about 175 miles. W. A. Frisby, president; L. Frisby, general manager; J. Andrewartha, chief engineer, Beeville. (March 25, p. 850.)

Pennsylvania Railroad.—Work is now under way building a four-track line, 2.25 miles long, through Bristol, Pa., to eliminate 10 grade crossings, over which all Pennsylvania trains running through Bristol now pass. The work is expected to be finished early in 1911, and involves the grading of about 550,000 cu. yds. of earth and the construction of 5,000 cu. yds. of arch masonry and 12,000 cu. yds. of bridge masonry. There will be nine bridges over streets and public roads, one over the Pennsylvania canal and three over streams. The street bridges will be of reinforced concrete with solid floors. About 250,000 cu. yds. of embankment have been made and 4,000 cu. yds. of concrete masonry built. One of the present tracks will be left on the old location, to be used as an industrial side track. The present line through Bristol is on a heavy curve and the new line will be located on a tangent through the western part of the city, with light curves east and west of the town. (Dec. 10, p. 1168.)

See Pennsylvania Roads.

Pennsylvania Roads.—According to press reports, the Pennsylvania Railroad, the Pittsburgh & Lake Erie and the Monongahela Railroad will jointly carry out improvements as follows: Construction of a bridge over the Monongahela river near Brownsville Junction, Pa., new classification yards, and the elevation of another yard to a new grade at Red Stone, also the erection of a 70-ft. concrete arch. The bridge, which is to carry double-tracks, will cost $750,000, and will have a channel span of 450 ft. The War Department has ordered the removal of the present structure. The Pennsylvania is to build the bridge and establish classification yards. The Pittsburgh & Lake Erie is to raise the yard at Red Stone and the Monongahela is to build the concrete arch and enlarge and elevate the yards at the same place.

Pine Bluff & Northern.—Incorporated in Arkansas to build from Pine Bluff, Ark., north via Tucker, Tomberlins, McCreanor and Hickory Plains to Searcy, about 80 miles. There will be a bridge over the Bayou Meto, 150 ft. long, and another bridge over the Arkansas river, 1,500 ft. long. Bids for the construction and equipment will be received about August 1. Preliminary survey is now being made. A branch is projected west to Little Rock, about 25 miles. W. J. Miller, president, Lamar, Mo.; W. M. Kavanaugh, first vice-president, and C. P. Harmwell, treasurer, secretary and general attorney.

Pittsburgh & Lake Erie.—See Pennsylvania Roads.

San Francisco & Transbay.—Incorporated in California, with $70,000 capital, to build from Niles, Cal., to Dunbarton Point, 70 miles. The incorporators include: H. H. McClosky, E. Schnulenhaus, J. Comerford and L. Block.

Southern New England.—See Grand Trunk.

Southern Pacific.—The line under construction for several years by the Morgan's Louisiana & Texas, from Lafayette, La., northeast to Port Allen (opposite Baton Rouge), about 52 miles, is expected to be finished and in operation by September 1. Additional tracks may be laid at Baton Rouge to accommodate the new line. It was expected to have the line finished last year, but the difficulties encountered in crossing the Atchafalaya river have delayed the work.

South Shore Traction.—This company recently opened the first section from Babylon, N. Y., west to Amityville, nine miles. The company was organized to build a 54-mile line from Patchogue to New York. All the rights-of-way have been secured and the necessary franchises secured for completing the line. J. G. Robin, New York, is the principal promoter.

Southwestern New York Traction.—Application has been made in New York for permission to build an electric line in Allegany county from Bolivar, N. Y., east to Wellsville, 18 miles. The company, which is capitalized at $200,000, will ask for authority to issue bonds to the amount of $300,000. The directors include: C. Van Curen, G. H. Bradley, J. A. Wilbur, Bolivar, and B. F. Patterson, New York.

Vera Cruz, Tabasco & Campeche.—An officer writes that the proposed route is from Santa Lucrecia, Mex., on the Tehuantepec National easterly through Xucuapam, Tancochapa, Hato de Oro, Pichucalco, Teapa, Tacotalpa, Salto de Agua, Palenque to Boca del Cerro, where the Usumacinta river is to be crossed, thence northerly through Tenosique, Picaytun, Mamantel, Chicbul, Sahcabchen and Champoton to Campeche, where connection will be made with the United Railways of Yucatan, 490 miles. An alternate route is being considered from Tancochapa or Hato de Oro northerly through Huimanguillo and Cárdenas to Rosario, thence easterly through

Cunduacán to San Juan Bautista, the capital of the state of Tabasco, where the Grijalva river is to be crossed, thence southeasterly through Macuspana to Salto de Agua. A line via San Juan Bautista will be a trifle longer than the other route. The proposed line will run through one of the richest sections of Mexico, which produces cacao, coffee, rubber, tobacco, tropical fruits, fine cabinet woods and wood from which pulp can be made for the manufacture of paper. Great forests of this timber are found in the district through which the line will pass. Petroleum is also found in paying quantities. Corn, the most valuable article of national food, is generally cultivated, two and three crops a year being raised. The line will open up over 40,000 square kilometers of the finest agricultural, grazing and timber lands in the Republic of Mexico, and will form an important link, connecting the City of Mexico and Merida. The Mexican government, appreciating the value of this line, has given the company a subsidy of $10,000 United States currency per mile on a maximum distance of 470 miles. The work will be light, but there will be considerable heavy bridging. Donato de Chapeaurogue, president, and A. L. van Antwerp, secretary, Apartado No. 870, City of Mexico.

FOREIGN RAILWAY NOTES.

January 1 last the total length of railway in Argentina was 15,860 miles, of which 86 per cent. belonged to 19 companies, and the remainder to the state. In 1909 the new lines opened measured 1,098 miles. The net earnings in the year were $41,410,000. The net was 5.01 per cent. on the capital of the private railways and 1.24 per cent. on that of the state lines.

The district of Cochin, on the west coast of India, near its southern end (latitude 10 degs. north) has a forest of about 50 square miles, which is almost absolutely impenetrable away from the few streams. Here three sections of logging railways have been laid, 20, 4 and 22 miles long, on inclines, with sections of much steeper grades, with double track, on which trains loaded with logs going down by means of a cable haul the empty trains going up—like the old "switch-back."

In Italy work is progressing on a new line between Rome and Naples which will be much shorter than the old one. For this a tunnel was begun at Montorso, which, according to a recent report, has encountered a novel obstacle, namely, a subterranean hollow or cave some 600 ft. long and extending down some 150 ft. below the level of the sea, from the roof of which, now that daylight is let in, great masses of rock are falling, while the water which filters through the overlying limestone strata falls in a constant shower.

The effect of the Siberian Railway on the traffic of Western Siberia is shown very distinctly by the increase in shipments of grain. These, which amounted to 114,687 tons in 1901, increased to 793,321 tons, equivalent to 26,417,000 bushels in 1908. Nearly three-quarters of this was wheat and flour. A great business has grown up wholly since the line was opened, and the towns on the line have increased greatly in population. The grain production is chiefly within a thousand miles of the European border. Further east grain is imported.

There has been for some time so great a production of petroleum in Galicia (Austrian Poland) that the home market was greatly overstocked, and to secure an outlet for some of it Austria negotiated with Germany for special rail rates, which enabled it to compete in the latter country with an institution described as the "Standard Oil Co." Now the Prussian State Railways have given the requisite three months' notice of the abrogation of these special rates, and a return to the regular tariff, which will be an increase of no less than 48 per cent. in the freight to Berlin, making it about 35 cents per 100 lbs. In Rumania also petroleum production is increasing notably, and there a large part of the wells are in the hands of a company controlled by the Standard Oil Co.

Railway Financial News.

ALGOMA CENTRAL & HUDSON BAY.—It is understood that there will shortly be offered to the public £770,000 ($3,850,000) new first mortgage 5 per cent. bonds, unconditionally guaranteed by the Lake Superior Corporation. It is understood that the proceeds from the sale of these bonds are to be used to build an extension of the road north from Sault Ste. Marie to the main line of the Canadian Pacific.

ATLANTA, BIRMINGHAM & ATLANTIC.—The Trust Co. of America (New York) gives notice to holders of the first collateral trust 5 per cent. four-year joint notes of the Atlanta & Birmingham Construction Co. and the A. B. & A., due May 1, 1910, that those who have not assented to the settlement arrangement made by the noteholders' protective committee should present their notes for payment.

ATLANTIC & LAKE SUPERIOR.—See Quebec Oriental.

BOSTON & ALBANY.—The New York State Public Service Commission has approved the proposed issue of $2,000,000 in 4 per cent. bonds to run 25 years, the proceeds to be used principally for improvements, which, however, are largely in Massachusetts.

BOSTON RAILROAD HOLDING CO.—The lower house of the Massachusetts legislature has passed the bill to allow the Boston Railroad Holding Co. to issue preferred stock, untaxable, to help develop the Boston & Maine. The bill is based upon Governor Draper's special message recommending such an issue. The bill had already passed the Senate.

CANADIAN NORTHERN.—See Duluth, Winnipeg & Pacific.

CENTRAL OF NEW JERSEY.—The directors have declared an extra dividend of 2 per cent., payable June 25 to stock of record June 17, and the regular quarterly dividend of 2 per cent., payable August 1 to stock of record July 19. The extra dividend is payable out of the earnings of the Lehigh & Wilkesbarre Coal Co. These dividends will increase Reading income from its stock holdings in Jersey Central about $290,000, making its annual income from that company's stock $1,450,400.

CHICAGO & NORTH WESTERN.—The Nebraska Railroad Commission and the Wisconsin and Michigan state authorities have authorized the company to issue $13,852,200 general mortgage bonds for improvements and to refund outstanding bonds. The bonds have not yet been sold and the formal approval at this time is obtained merely to provide for the sale of the bonds when desired.

CHICAGO, MILWAUKEE & ST. PAUL.—The 250,000,000 francs ($50,000,000) 4 per cent. 15-year debenture bonds sold to a French syndicate, as announced last week, have been entirely resold to small investors and small banks, the number of individual investors being about 250,000 and the average allotment about 1,000 francs ($200).

CORONADO RAILWAY.—See San Diego Southern.

DELAWARE RAILROAD.—See Philadelphia, Baltimore & Washington.

DETROIT, TOLEDO & IRONTON.—The interest coupons on the general lien bonds, due December, 1909, are being paid at the Knickerbocker Trust Co. in the interests of the consolidated mortgage bondholders. A committee representing these bondholders is being formed to actively take up the reorganization of the company.

DULUTH, WINNIPEG & PACIFIC.—Lazard Brothers & Co., London, recently offered at 92½, £950,000 ($4,750,000) 4 per cent. first mortgage debenture stock, on which principal and interest is unconditionally guaranteed by the Canadian Northern.

DUNKIRK, ALLEGHENY VALLEY & PITTSBURGH.—Stockholders are to vote July 1 at Albany, N. Y., and August 1 at Philadelphia, Pa., on the question of making a mortgage to se-

cure an issue of 4½ per cent. 50-year bonds, amounting to $5,000,000, for improvements and to refund outstanding bonds. Stockholders are also to vote on the question of modifying the lease to the New York Central & Hudson River so as to provide that in addition to the payment of an annual dividend of 1½ per cent. on the stock, as provided in the contract, there should be paid as rental, interest on the new bonds.

Fort Dodge, Des Moines & Southern.—On the application of the trustee of the first mortgage bonds of 1907 the property of the company has been put in the hands of Homer Loring, president, and Parley Sheldon, a banker of Ames, Iowa, as receivers.

Galveston, Harrisburg & San Antonio.—The company has asked the Texas Railroad Commission for authority to issue $5,384,000 bonds secured on the Galveston-Victoria division. An issue of $10,000,000 30-year 6 per cent. bonds was authorized May 23 by the stockholders.

Laramie, Hahn's Peak & Pacific.—Lawrence Barnum & Co., New York, are offering at par a block of the $1,800,000 Laramie, Hahn's Peak & Pacific first refunding mortgage 6 per cent. bonds of 1907-1932. The Hahn's Peak road is to be built from Laramie, Wyo., where it connects with the Union Pacific, to Hebron, 108 miles, and there is now in operation 30 miles of this line from Laramie to Centennial.

Metropolitan (N. Y.).—Adrian H. Joline and Douglas Robinson, receivers of the Metropolitan Street Railway Company, having reached an agreement with the city authorities for the settlement of the special franchise taxes due from the company by the payment of $3,750,000, Judge Lacombe, in the United States circuit court, has authorized the issuance of receivers' certificates to the amount of $3,000,000. The certificates are to run for a year and will bear 6 per cent. interest.

Mexican International.—See National Railways of Mexico.

Missouri, Kansas & Texas.—Harry S. Black and F. P. Brazier have been elected directors to fill vacancies on the board.

National City & Otay.—See San Diego Southern.

National Railways of Mexico.—A press despatch from Mexico City says that on July 1 the Mexican International, now operated separately, will become a part of the National Railways of Mexico.

New Mexico Central.—The trustee of the $2,000,000 mortgage bonds of 1901 has brought suit in New Mexico to foreclose the mortgage.

New York Central & Hudson River.—See Dunkirk, Allegheny Valley & Pittsburgh.

New York, New Haven & Hartford.—The Massachusetts Senate without dissent has ordered to a third reading the bill to validate the present outstanding securities of the New Haven, after an examination of its property by the railroad commission, the tax commissioner and the bank commissioner.

Norfolk Southern.—A fourth suit has been brought by the Vandyke-Zell syndicate, of Philadelphia, to annul the sale of the Norfolk & Southern property to the new company, the Norfolk Southern. The property is in the hands of the new company and is being operated by it, but the sale of $5,780,000 bonds is delayed pending decision of the court, which is expected about July 1.

Philadelphia, Baltimore & Washington.—The directors of the Delaware Railroad have declared a 2¾ per cent. dividend, payable July 1, for the four months ended June 30. This is at the rate of 8 per cent. per year and is the first payment under the lease of the Delaware Railroad to the Philadelphia, Baltimore & Washington.

Pittsburgh, Cincinnati, Chicago & St. Louis.—Speyer & Co. and Kuhn, Loeb & Co., both of New York, have bought $4,000,000 consolidated mortgage 4 per cent. bonds, series G, due 1957, and are offering these bonds to the public at 96½. Bonds are guaranteed principal and interest by the Pennsylvania Company. They are issued to retire at maturity July 1, 1910, $1,967,000 Jefferson, Madison & Indianapolis 7 per cent. bonds, which are a first lien on 222 miles, on which the consolidated mortgage bonds now become a first lien. The additional proceeds from the sale of the bonds is to be used to pay for double-tracking.

Quebec Oriental.—The railway commission of Canada is asked to recommend the sanction by Parliament of the sale by the Royal Trust Co. of the Baie des Chaleurs section of the Atlantic & Lake Superior to the Quebec Oriental.

Reading Company.—P. A. B. Widener has been elected a director, succeeding Joseph S. Harris, deceased.

San Diego Southern.—The two companies, the National City & Otay and the Coronado Railway, whose property was taken over by the San Diego Southern some time ago, have been dissolved. The San Diego Southern was incorporated in 1908 with $5,000,000 authorized stock. In May, 1910, there was $1,515,000 stock paid in. The company has no outstanding bonds. The line runs from San Diego to Tia Juana, 18½ miles, with branches, a total of 50 miles. The line between San Diego and Otay, 12 miles, is operated by electricity.

Seaboard Air Line.—The executive committee has recommended the full payment on August 1 of the first semi-annual 2½ per cent. interest coupon on the outstanding $24,979,500 adjustment 5 per cent. income bonds. The distribution calls for $624,487. The earnings of the six months prior, available for payment of interest on the adjustment bonds, amounted to $1,569,015.

Southern Pacific Co.—The $25,000,000 bonds sold in Germany, as reported last week, are to be 40-year 4 per cent. bonds, issued under a mortgage on the Bay Shore line and on real estate terminals.

Senator Smoot has reported from the committee on claims of the Senate bill to reimburse the Southern Pacific to the amount of $773,647 for money the company spent between December 1, 1906, and November 30, 1907, in closing the overflow of the Colorado river.

Texas Central.—R. H. Baker has exercised the option to buy the majority of the $1,324,500 preferred and $2,675,000 common stock of the Texas Central. It is said that the purchase price is about par for each class of stock, and that holders of the minority stock will be given the privilege of selling their stock at about the same price.

Western Ohio Railroad.—This company, incorporated with $10,000 stock, which is to be increased to $1,000,000, is to take over under lease the property of the Western Ohio Railway. The holders of $3,000,000 common stock of the Railway will be offered the privilege of exchanging their Railway stock for Railroad stock on the basis of three shares of the Railway stock for one of the Railroad.

The extension of the Paraguay Central Railway from Pirapo to Encarnacion, on the Parana river, is progressing steadily, the rails being laid into Encarnacion by the end of March. Ferryboat connection will be made with Posadas, on the Argentine side of the river, to which point the Argentine Northeastern Railway is being extended. This will give Paraguay its first connection with the outside world by rail, although the Paraguay Central is the oldest railway in South America. Through service is expected between Asuncion and Buenos Aires by the end of 1910. For through service the wider gage of the Paraguay line is to be changed to that of the Argentine Northeastern, and the old rolling stock entirely replaced by new equipment which has just arrived from England. This consists of 20 locomotives, one officers' car, 223 freight, two dining, three parlor, two compartment, two sleeping and 12 day cars, eight baggage, mail and express cars, one wrecking car and one 20-ton, flat-bottom boat with steam winch. Of the $1,410,000 additional stock issued by the Paraguay Central $1,070,000 was taken by the Argentine Government, which also secures the old rolling stock for use on Patagonia railways. Argentina also appropriated $10,000,000 for the extension of the railway to the north.

Supply Trade Section.

The Griffin Wheel Co., Chicago, is to build four new buildings at its South Tacoma (Wash.) plant, at a total cost of $125,000.

H. W. Davis, 2 Rector street, New York, has been appointed eastern representative of the Falls Hollow Staybolt Company, Cuyahoga Falls, Ohio.

George B. Foster has been appointed Chicago sales manager of the Wisconsin Engine Company, Corliss, Wis. His office will be in the Fisher building.

The Isthmian Canal Commission will receive bids up to June 24 for electrical material, including fixtures, fittings, arc lamps, carbons, fuses, cable, wire, conduit, tape, etc. (Circular No. 590), and up to June 28 for a locomotive crane, steel plates and lumber (Circular No. 589).

The Bettendorf Axle Co., Davenport, Iowa, announces the removal of its Chicago office from the Old Colony building to larger quarters in room 1508 in the McCormick building. The company will keep an exhibit there of several full-size Bettendorf trucks and side frames, also Bettendorf body and truck bolsters.

The Lackawanna Steel Company has decided to move its principal offices from New York to its works at Lackawanna, near Buffalo, N. Y., as soon as the necessary additions to its present office building at Lackawanna can be completed. Selling offices necessary for local business will be maintained at the present location, 2 Rector street, New York City.

At the annual meeting of the stockholders of the Joseph Dixon Crucible Company, Jersey City, N. J., the old board, consisting of Geo. T. Smith, William Murray, William H. Corbin, Edward L. Young, Geo. E. Long, William H. Bumsted and Harry Dailey, were unanimously re-elected. The board of directors re-elected the former officers, namely, Geo. T. Smith, president; William H. Corbin, vice-president; Geo. E. Long, treasurer; Harry Dailey, secretary; J. H. Schermerhorn, assistant treasurer and assistant secretary. William H. Corbin was also re-elected as counsel.

Lucius I. Wightman, for the past six years advertising manager for the Ingersoll-Rand Company, New York, has resigned, effective August 1. Mr. Wightman will open an office in New York City as an independent specialist in machinery advertising, handling the accounts of manufacturers of machinery and engineering products. He brings to his new enterprise qualifications peculiarly fitting him for this line of work. To his long experience in managing one of the largest advertising accounts and publicity departments in the machinery field, he joins a prior experience of years in practical mechanical and electrical engineering, construction work, machine design and manufacture and machinery selling. He is a graduate engineer, the author of a text-book on compressed air, and one of the authorities on compressed air subjects.

TRADE PUBLICATIONS.

Ore Car.—The Pressed Steel Car Co., Pittsburgh, Pa., has just issued a leaflet describing its all-steel, center dumping, self-cleaning, 50-ton ore car.

Exide Battery.—The Electric Storage Battery Co., Philadelphia, Pa., has issued its bulletin No. 124 describing the Exide battery in emergency service.

Air Compressors.—The Ingersoll-Rand Co., New York, in form No. 3006, gives a complete description, with illustrations, of its Class O duplex, steam-driven air compressors.

Incandescent Lighting System.—The Western Electric Co., New York, has just issued bulletin No. 5,533 which describes the Hawthorne series incandescent lighting system with sunbeam Madza lamps.

Lifting Magnets.—The Cutler-Hammer Clutch Co., Milwaukee, Wis., has issued a leaflet containing detail information and description with illustrations of the lifting magnets made by this company.

Metal Culverts.—The Pennsylvania Metal Culvert Co., Warren, Pa., has issued a leaflet containing a number of 6-in. x 10-in. half-tone illustrations of installations of its culverts on steam and electric railways.

Cardwell Friction Draft Gear.—The Union Draft Gear Co., Chicago, has just issued a new catalogue containing a large number of full-page illustrations, with descriptions, of the Cardwell friction draft gear.

Engine and Turret Lathes.—Lodge & Shipley, Cincinnati, Ohio, has issued catalogue No. 21 covering the engine and turret lathes which it manufactures. These machines are designed especially for using high-speed steels.

Russell Snow Plows and Flangers.—The Russell Car & Snow Plow Co., Ridgway, Pa., has issued its 1910 catalogue of Russell snow plows and flangers for use on steam railways. A number of large illustrations are given, with specifications, and also a list of the railways now using these snow plows.

Storage Battery.—The Electric Storage Battery Co., Philadelphia, Pa., has issued a booklet entitled "The Story of the Storage Battery," which contains some very interesting information regarding the wide use of the storage battery for various purposes and the position of this company in the storage battery field.

Bartley Nut and Bolt Fasteners.—The American Nut and Bolt Fastener Co., Pittsburgh, Pa., has just issued its catalogue No. 6 on Bartley nut and bolt fasteners. This catalogue replaces all preceding ones and contains detail descriptions, with illustrations, of these specialties, with a number of lists covering prices and sizes.

Mallet Locomotive.—The American Locomotive Co., New York, has just issued bulletin No. 1004 entitled "Articulated Compound Locomotives Built for the Delaware & Hudson Company," which contains a very complete description of these locomotives and in convenient form. A description of these locomotives appeared in the *Railway Age Gazette* of May 27.

Flexible Staybolts.—The Flannery Bolt Co., Pittsburgh, Pa., has just issued a very interesting and valuable catalogue showing the various standards and assemblages of Tate flexible staybolts. The staybolt is illustrated by dimensioned half-tone cuts, showing both elevation and sectional views. Accompanying the catalogue is a revised price list covering certain changes, effective June 1.

Chicago, Rock Island & Pacific.—A booklet has been issued by the passenger department of the Chicago, Rock Island & Pacific, in connection with the thirty-first triennial conclave of the Knights Templar, to be held in Chicago Aug. 8-13, 1910. Numerous photographs of points of interest in Chicago are printed as comparisons to pages reproduced from the souvenir of the twenty-first triennial conclave issued by the Rock Island Lines in 1880. This parallel arrangement makes an interesting illustration of the growth, not only in the Masonic interests and Knight Templarism, but also in the development of railway terminals, equipment and service in the last 30 years.

Union Pacific.—The Union Pacific is distributing a folder advertising the annual Rose Festival at Portland, Oregon, June 6-11. A short description of this carnival and full information on routes from the East to Portland is given. The illustrations are beautiful colored views of the roses to be seen in Portland. A 20-page booklet describes the tours to the Yellowstone National Park, Lake Tahoe, and the Yosemite Valley. The descriptive matter is based on 14 colored illustrations of scenes along these tours. "An Inland Voyage to Alaska and Return" is the title of a booklet describing our northern possession and the method of reaching it by land from Seattle, which is reached by the Union Pacific, the Oregon Short Line, the Oregon Railroad & Navigation Co. and the Oregon & Washington.

Metal Culverts.—The Canton Culvert Company, Canton, Ohio, manufacturers of Acme nestable corrugated No-Co-Ro

metal culverts, Duro perforated corrugated railway drains, etc., has recently mailed to railway engineers and maintenance of way men, prominent road contractors and others throughout the country, an attractive four-page circular letter embodying references to business with the U. S. Government, foreign governments, prominent railways, etc. The circular reproduces several pages from the company's handsomely illustrated 24-page brochure entitled "Acme Culverts for Steam and Electric Railways," and presents strong evidence that Acme culverts, made of their characteristic heavy gage highly rust-resistant No-Co-Ro metal galvanized sheets, are in favor with the best judges and large users of culverts.

RAILWAY STRUCTURES.

Belle Vernon, Pa.—Contract is said to have been given to the Cuthbert Brothers Construction Co., Pittsburgh, Pa., for building the brick passenger station for the Pittsburgh & Lake Erie in Belle Vernon, at a cost of about $15,000. (May 27, p. 1327.)

Bloomington, Ill.—It is said that residents of this place are raising $165,000 for improvements at the Bloomington shops of the Chicago & Alton. The railway company, it is understood, has agreed to spend $1,000,000 and put up a union passenger station.

Bristol, Pa.—See Pennsylvania Railroad under Railway Construction.

Bronte, Tex.—See Tennyson, Tex.

Brownsville Junction, Pa.—See Pennsylvania Roads under Railway Construction.

Cleveland, Ohio.—According to local reports, the Lake Shore & Michigan Southern has applied for permission to change the location of its tracks at East 105th street preparatory to building a new station at that place. Plans are said to be made for a passenger station, freight house and express buildings. (April 22, p. 1069.)

Fort Chadbourne, Tex.—See Tennyson, Tex.

Kingman, Kan.—The Atchison, Topeka & Santa Fe is taking bids for the building of passenger stations at Kingman, Harper and Stafford, Kan., and Holly, Colo.

Mexico, Mo.—The Chicago & Alton has prepared plans for a brick freight station to cost $16,400.

Milwaukee, Wis.—The Milwaukee Electric Railway & Light Co. will put up a new power plant, it is said, near the Highland boulevard viaduct. Later it is planned to build a large car shop in connection with this improvement. All of the buildings are to be of reinforced concrete construction.

Portland, Ore.—An officer of the Harriman Lines is quoted as saying that $250,000 will be spent for improvements as follows: Two new stations on the Oregon Railroad & Navigation Company's line, including a new freight station in Portland, and machine shop and roundhouse improvements at Le Grand. Work was recently started on a new $1,600,000 bridge over the Willamette river to replace the present structure.

Punxsutawney, Pa.—An overhead bridge is to be built to the central part of Punxsutawney, over the Pennsylvania Railroad tracks and the county bridge at South Pennsylvania street. It is said that the railway company will pay part of the cost of the improvements.

Red Stone, Pa.—See Pennsylvania Roads under Railway Construction.

Tennyson, Tex.—An officer of the Kansas City, Mexico & Orient writes that work is now under way putting up a combined freight and passenger station with limestone walls and red tile roof, one story high, 24 ft. x 85 ft., to cost $2,500. in Tennyson. A station is also being put up at Bronte, 24 ft. x 100 ft., and another at Fort Chadbourne, 24 ft. x 85 ft.

Toronto, Ont.—The Canadian Pacific is said to have bought land in Toronto, and will put up an office building and freight shed.

Late News.

The items in this column were received after the classified departments were closed.

W. D. Lee has been appointed general superintendent of the Rio Grande Southern, with office at Ridgway, Colo.

C. H. Ketcham, for the last six months with the Western Pacific, has been appointed assistant superintendent of the Southern Pacific at Oakland, Cal.

Plans have been made by the city engineer for a bridge to be built over the Lebanon Valley tracks at Tulpehocken, Reading, Pa., which will be submitted to the Philadelphia & Reading.

H. G. Elliott has been appointed first assistant general passenger agent of the Grand Trunk, with office at Chicago, and W. S. Cookson has been appointed assistant general passenger agent, with office at Montreal, Que.

An officer of the Pacific & Idaho Northern writes that contracts are to be let at once for building the extension from Evergreen, Idaho, northeast to Meadows, 15 miles. The line is to have maximum grades of 2 per cent. and maximum curvature of 12 degs. (June 10, p. 1438.)

Consideration of the conference report on the railway bill is delayed in Congress by the illness of Senator Elkins; but both senators and representatives continue to predict that there will not be much discussion on the report and that Congress will be able to adjourn about July 1.

The governor of New York has signed the bill to permit the operation of the Steinway tunnel, the tunnel between the Manhattan and Queens boroughs, under the East river, which was finished more than two years ago but which has lain idle because of the failure of the company and of disputes as to the rights of the city.

The St. Louis & San Francisco and the Southern Pacific lines in Texas have made a traffic agreement, running for 12 years, by which these lines will work in each other's interests in the fostering of traffic from St. Louis, Kansas City and other points in the north to south and central Texas, and *vice versa*. The connecting point between the two lines is Dallas.

New York bankers say that negotiations are under way for the issue of a part of the $30,000,000 4½ per cent. equipment trust certificates of the New York Central which have been in the hands of J. P. Morgan & Co. for some time. The success of the recent offering of $11,000,000 Pennsylvania equipment trust notes on a 4½ per cent. basis is given as a reason for a sale of New York Central certificates at this time.

Bankers in New York City say that the losses by fraudulent bills of lading, which have recently been reported in the newspapers, aggregate nearly ten million dollars, and they are working strenuously for the passage of the Stevens bill, now before Congress, which makes the railways responsible for bills of lading issued by their agents. The sum named covers the fraudulent cotton bills in the South and fraudulent grain bills reported from Albany, N. Y. A committee of insurance men is now making inquiries in the southern states looking to the introduction of a scheme of insurance on bills of lading.

In the United States district court at Philadelphia this week the Philadelphia & Reading and the Lehigh Valley were found guilty of having violated the law in canceling demurrage charges aggregating $231,000 against the Bethlehem Steel Company, and the steel company was found guilty of soliciting and accepting the cancellation. Witnesses for the defense declared that the railways believed they were overcharging the steel company for demurrage and that they adjusted the matter to their mutual satisfaction, but the government retorted that if they were under that impression it was their duty to make the adjustment through the Interstate Commerce Commission. In the indictment against the steel company there were 160 counts. There were 126 against the Lehigh Valley and 87 against the Reading.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Ha Ha Bay Railway has ordered one double-end locomotive from the American Locomotive Co. It will have 14-in. x 22-in. cylinders, 44-in. driving wheels and a total weight of 80,000 lbs.

The Grand Trunk, reported in the *Railway Age Gazette* of May 13 as figuring on 50 locomotives, is said to have ordered 15 consolidation and 25 mogul locomotives. This item is not confirmed.

B. T. Babbitt has ordered one four-wheel saddle tank switching locomotive from the American Locomotive Co. It will have 13-in. x 18-in. cylinders, 36-in. driving wheels and a total weight of 56,000 lbs.

D. A. Langhorne, Brent, Ky., has ordered one four-wheel saddle tank switching locomotive from the American Locomotive Co. It will have 10-in. x 16-in. cylinders, 30-in. driving wheels and a total weight of 36,000 lbs.

The Solvay Process Co., Syracuse, N. Y., has ordered one six-wheel switching locomotive from the American Locomotive Co. It will have 19-in. x 24-in. cylinders, 51-in. driving wheels and a total weight of 123,000 lbs.

The Central Railway of Brazil has ordered two Pacific passenger locomotives from the American Locomotive Co. One will have 22-in. x 24-in. cylinders, 50½-in. driving wheels and a total weight of 200,000 lbs., and the other 17-in. x 20-in. cylinders and 37-in. driving wheels.

The Harriman Lines have ordered 85 locomotives from the Baldwin Locomotive Works for delivery in October, November and December. These will be divided as follows: 18 ten-wheel, 10 eight-wheel, 37 Pacific and 20 Atlantic. These will be divided between the lines of the Harriman system as follows: Oregon & California, 6; Oregon & Washington, 7; Oregon Short Line, 15; Oregon Railroad & Navigation, 22; Union Pacific, 10; Southern Pacific, 20; Southern Pacific of Mexico, 3, and Sonora Railway, 2.

CAR BUILDING.

Morris & Co. have ordered 200 beef cars from the Haskell & Barker Car Company.

The Charlotte, Harbor & Northern has ordered 90 freight cars from the Barney & Smith Car Co.

The Phoenix Bridge Co., Phoenixville, Pa., has ordered two flat cars from the Pressed Steel Car Co.

The Kansas City Southern has contracted with the Sheffield Car & Equipment Co. for the repair of 500 box cars.

The Illinois Central is said to have ordered 50 passenger cars from the Pullman Company. This item is not confirmed.

The United Railroads of San Francisco, Cal., are reported as contemplating ordering 100 electric cars. This item is unconfirmed.

The Illinois Traction Co. has ordered 10 interurban motor, 5 trailer observation and 29 single-truck P. A. Y. E. city cars from the Danville Car Co.

The Grand Trunk has ordered 1,000 all-steel hoppers and 1,500 steel underframe box cars from the Canada Car Company, and 500 steel frame box cars from the Silliker Car Co. This company has also ordered a number of passenger cars.

The Hawley Lines are taking prices on freight cars to be divided as follows: Minneapolis & St. Louis, 750 box and 250 stock; Iowa Central, 500 box; Chicago & Alton, 250 automobile, 250 furniture and 3,000 box. All but 250 of these cars will have steel underframes and all but 250 will be of 80,000 lbs. capacity.

MACHINERY AND TOOLS.

The Kansas City Southern is taking prices on seven or eight lathes and upright drills.

Westinghouse, Church, Kerr & Co. are taking prices on machine tools for the Kansas City, Mexico & Orient, to cost $10,000.

IRON AND STEEL.

The Great Northern has ordered 11,000 tons of rails from the Lackawanna Steel Co.

The Canadian Northern has ordered 5,500 tons of rails from the Lackawanna Steel Co.

The Boston & Maine has ordered 250 tons of structural steel from the American Bridge Co.

The Chicago, Milwaukee & St. Paul has ordered 250 tons of bridge steel from the American Bridge Co.

The New Orleans Railway & Light Company has ordered 500 tons of rails from the Carnegie Steel Co.

The Chicago, Burlington & Quincy has ordered 5,000 tons of ferro titanium rails from the Lackawanna Steel Co.

Stone & Webster have ordered 5,700 tons of rails from the Pennsylvania Steel Co. for the Galveston & Houston Interurban Electric Ry.

The New York, Chicago & St. Louis, reported in the *Railway Age Gazette* of June 10 as in the market for 2,000 tons of bridge steel, has ordered 1,900 tons from the King Bridge Co.

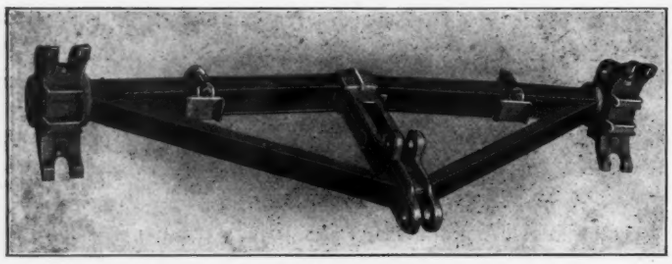
FOREIGN RAILWAY NOTES.

Negotiations are being actively carried on with an American company [the New York address of which is on file at the bureau of manufactures] concerning the construction of a railway line from Sivas to Van, with a branch line to the port of Youmourtalik, near Alexandretta, and another line to Mosul. Thus there will be a network of railway in Anatolia, the trunk line having a length of 1,242 miles. The American concern requires authorization to exploit the mines within a certain distance on both sides of the line and renounces, in return, any claim to a guarantee. The government has accepted in principle this proposition, but on terms requiring the exploitation of the mines within a reasonable period of time. A railway from the port of Samsoun, Turkey, will be connected with the Sivas-Van line at Sivas and extended to Angora. Another will connect the port of Trebizond with Erzeroum and, later on, be extended to the Russian and Persian borders. These latter lines will be built by the government, which is expected to be able to find money in foreign markets for the construction of both roads and railway lines.

A railway is to be built from the port of La Paloma, Uruguay, on the Atlantic, to Treinta y Tres, passing the towns of Rocha and Lascano, and crossing the Cebollati river at its highest navigable point, about 127 miles in length. The state guarantees 3½ per cent. interest on a cost of about $41,500 per mile, which is to be paid in full when the net profits do not exceed one-half per cent. of the capital. Work is to start within six months after the approval of the plans, which are to be submitted eight months after being presented. The railway is to be ready for traffic 45 months after starting. Moles will be constructed at the port of La Paloma and at the crossing of the Cebollati river, although there will be no monopoly. The concession is for 90 years, at the termination of which period the works pass to the state. Colonies will be established, for which a rebate of 20 per cent. of the tariff will be allowed on agricultural products, machinery, utensils and building material. This railway will open up for settlement a vast region now thinly populated and of great argicultural and mineral possibilities.

The Huntoon "LN" High Speed Brake Beam.

The modern high-speed brake reaches a limit at about 18,000 lbs. pressure per brake-shoe because at this load the friction is sufficient to melt the metal surface of the shoe and nothing is gained by the use of higher pressures. It has been determined, therefore, that a maximum load of 36,000 lbs. on the brake-beam should be the limit for emergency application, that under this load the deflection should not exceed $\frac{1}{16}$ in., and that there should be no permanent set at 70,000 lbs. The Huntoon "LN" brake-beam was designed to meet this specification and the tests show a deflection of .057 in. under a load of 35,500 lbs. and .11 in. under a load of 70,000 lbs. In the construction of this beam steel of high tensile strength is used, the steel castings having a tensile strength of from 70,000 lbs. to 80,000 lbs. per sq. in.



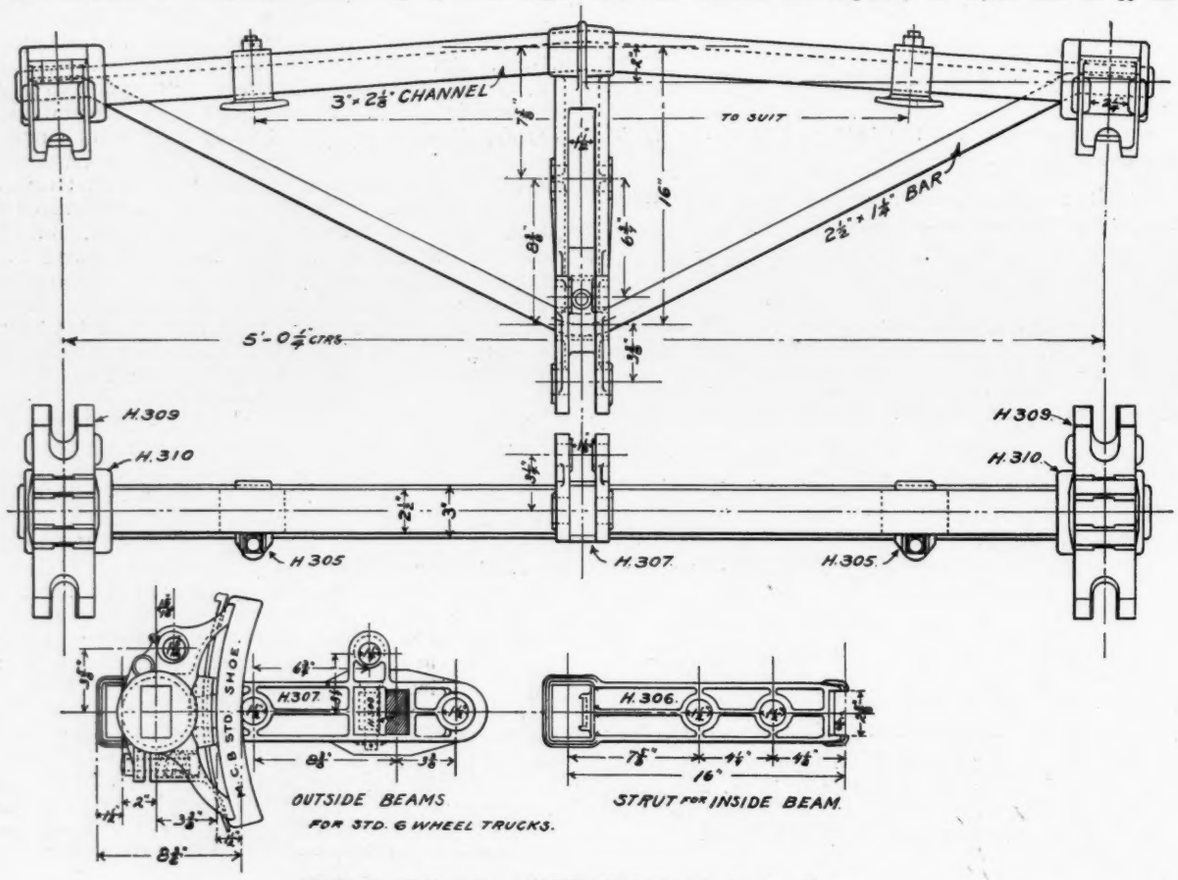
Huntoon "LN" High Speed Brake Beam.

The tension member is made of specially rolled high tensile steel (2½ in. by 1¼ in. cross section), having no permanent deflection under a load of 35,000 lbs. per sq. in., thus having an elastic value of 109,000 lbs. at the center of the truss, and 218,000 lbs. breaking strength; the factor of safety is 6 to 1 over service conditions, as compared with 3 to 1 in the older types. The ends are upset, as in the former approved Huntoon construction, and are headed to engage the channel compression member, thus locking the truss. The compression member is a special rolled 2½ by 2-in. high carbon steel channel, milled to receive the tension member and sleeve, thus insuring an absolute fit, preventing slack movement. The compression and tension members are held together by a cast steel sleeve, which in turn is provided with large shrinkage collars, which are heated and shrunk on, bringing the fitted ends tightly together and preventing all preliminary deflection; the sleeve is secured from endwise movement by a steel rivet.

The triple strut is one piece of cast steel, whose smallest cross sectional area is 3⅛ sq. in., of a load value of over 218,000 lbs., being 50 per cent. in excess of the breaking value of the connecting rods and exceeding the shearing values of the pins.

The automatically adjustable heads (Huntoon patent) are something entirely new in adjustable brake head construction. For this beam they are made of high tensile steel, of slightly increased metal over the old standard high-speed malleable iron head. The brake lugs extend across the full width of the head, giving a full bearing surface of solid metal for the brake-shoes so that the pressure is transmitted through solid metal from the beam to the wheel. The steel bolt and spring secures the hinged steel clip at the back of the head securely to the steel sleeve upon which the head moves. This binding friction prevents the head from slipping or turning except when the brake pressure is applied, when it immediately adjusts itself to the contour of the wheel, remaining in that position until automatically re-adjusted through the wear of the shoe. Instead of the spring clip pushing the head away from the beam, thus causing preliminary deflection, this construction pulls the head up tight against the face of the sleeve, so that there is absolutely no lost motion, and consequently no preliminary deflection. At the same time the spring is in such position as to take up all wear, and no matter how long in service, the heads are never loose and cannot be shaken or rattled loose.

The Joliet Railway Supply Co. also manufactures a "P. C." high-speed brake-beam similar to the "LN" beam, of the same design and limited dimensions, but of increased capacity to meet the requirements of the new Westinghouse "P. C." air-brake equipment. This beam is interchangeable in every way with the "LN" beam, the same brake-heads being used on both beams. Its capacity is 45,000 lbs. at $\frac{1}{16}$ in. deflec-



Details of Huntoon "LN" High Speed Brake Beam.

tion, with no permanent set at 80,000 lbs. These beams are manufactured by the Joliet Railway Supply Co., Monadnock block, Chicago.

The Hobart Allfree Valve Gear.

The new valve gear of the Hobart Allfree Company, as applied to a locomotive on the Kansas City Southern, is shown in the accompanying illustrations. The operation of the gear will be understood by reference to the drawing and the following description: Beginning with the eccentric crank "A" motion is transmitted through the eccentric rod "B" to the transmission bars "D," the radius bar "C" being connected at its lower end between the transmission bars, and at its upper end to the radius block "J." The position of the radius block "J" upon the radial guides "N" determines the length of cut-off. The position shown in the diagram would be full gear back motion, whereas the opposite position at the forward end of the radial guides would be full gear forward. In the center it would be neutral and would impart no motion to the rocker "E," but the combination lever F through its connection to the crosshead G and H would impart a sufficient movement to the valve to pull off the lap and give the lead, which is the only function of the combination lever. By reason of the lap and lead movement in the valve coming from the crosshead, the movement at the time of opening and closing will be rapid, lowering the pre-admission materially below that of the link motion, but quite similar to a Walschaert motion, except that it is perfectly even, that is, the same pre-admission at either end.

It will be seen from the table of valve events that the closure is unusually late. This, however, is due to the use of the compression controlling valve. Without this valve the closure event would be but little later than a Walschaert gear. It will be observed from the table of events that a very long steam line is obtainable in full gear. With a valve having 1 in. steam lap, over 90 per cent. may be had.

The cut-offs are quite even, practically the same at one end as the other. If there is any difference the long cut-off will always occur at the back end of the cylinder instead of the front, which is the case with other gears.

The reverse shaft "M" is acted upon through the reach rod and motion is transmitted from it through the arms "L" and links "K" to the radial block "J." All of the working parts of the gear are built as a unit, that is, the same design is applicable to practically all types of engines, the only change necessary being that the frame "O" may be lengthened or shortened to suit varying designs of locomotives.

The material advantages of this type of gear, aside from its strength and durability, are that inasmuch as the eccentric rod is on a center line on the driving wheels, at its connection with the transmission bars, the engine will not get out of square due to rounding curves or rough track. No amount of variation of the engine on its springs can put the valves out of square. Even though the springs break the valves will not be out a noticeable quantity. Further material advantage is found in the fact that there is no vibration to the reverse lever regardless of its position, thus eliminating all danger to the engineman, and as the gear is amply strong to withstand any speed in full gear, accidents are not likely to occur. There is sliding wear on the working parts, all joints being pin joints, bronze bushed, unusually large; no heating or abrasion, therefore, will be experienced.

The gear is designed to give as much as 7½ in. valve travel. Even more may be obtained if desirable, or, on the other hand, it may be stopped at any earlier point. Owing to its unusual strength of construction and perfect alinement and balance, the gear may, with perfect safety, be operated at any speed that it is possible for the locomotive to obtain at full stroke, without the slightest danger of heating, locking or other injury to any of the parts. Considerable attention has been given to methods of lubrication. Oil cellars are provided at all important joints, with hard grease cups on the eccentric pin connection. There being no vibration whatever to the reverse lever, the gear will be built when desired with an air reverse, consisting of a small air cylinder connecting either to the reach rod or reverse lever and operated with an air valve similar to the brake valve. By its use no physical effort is required, except to unlatch the lever.

This gear, together with the Allfree cylinders and valves, constitutes a system of great merit. Through the use of the compression controlling valve, from ⅜ in. to ½ in. of the exhaust lap is used on the main valve, making it possible to get much more work out of the steam through increased expansion. The compression controlling valve is timed to release simultaneously with the main valve, a much greater

VALVE-MOTION REPORT.

Engine No. 486. Cylinders, 22 in. x 30 in. Diameter drivers ..... Kansas City Southern R. R.
Class 2-8-0. Type of valves, Allfree. Service, Freight.
Type of gear, Allfree; Radial. Exhaust lap, 7/8-in. Admission, Internal.
Steam lap, 1⅛ in. Steam port, 1¼ in. Max. valve travel, 7 in.

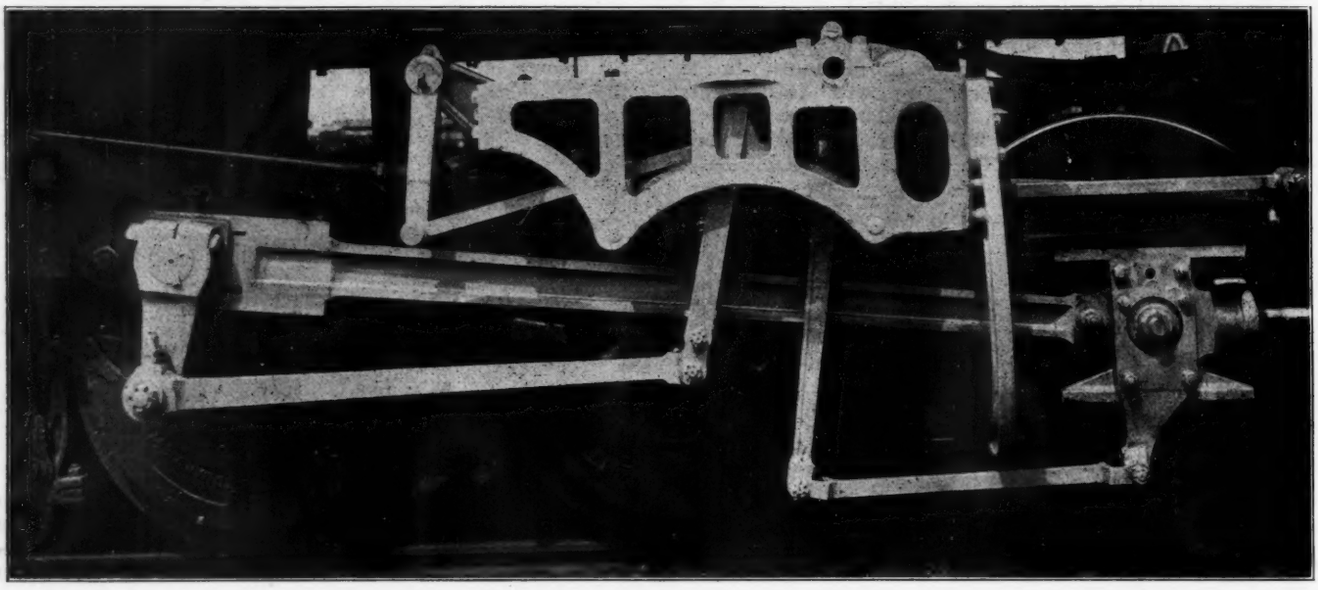
Motion		Cut-off position.	Cut-off. Front.	Cut-off. Back.	Pre-admission. Front.	Pre-admission. Back.	Lead. Front.	Lead. Back.	Port opening Front.	Port opening Back.	Release. Front.	Release. Back.	Closure Front.	Closure Back.
Forward.	Right hand side	Full gear	25¾ in.	25⅞ in.	1/16-in.	1/16-in.	3/16-in.	3/16-in.	Full.	Full.	29½ in.	29½ in.	1/8-in.	1/8-in.
		50 per cent.	15 in.	15¼ in.	1/4-in.	3/16-in.	1/16-in.	1/16-in.	1/8-in.	1/8-in.	27¼ in.	27⅛ in.	3/4-in.	3/4-in.
		33 per cent.	10 in.	10⅛ in.	5/8-in.	1/2-in.	3/16-in.	1/16-in.	1/8-in.	1/8-in.	26¼ in.	26¼ in.	1⅝ in.	1⅝ in.
		25 per cent.	8¾ in.	8¾ in.	7/16-in.	7/16-in.	3/16-in.	3/16-in.	11/32-in.	11/32-in.	25½ in.	25½ in.	2⅜ in.	2⅜ in.
Backward.	Right hand side	Full gear	26⅛ in.	26¼ in.	1/16-in.	1/16-in.	3/16-in.	3/16-in.	Full.	Full.	29½ in.	29½ in.	1/8-in.	1/8-in.
		50 per cent.	15 in.	15 in.	1/8-in.	1/8-in.	1/8-in.	1/8-in.	1/8-in.	1/8-in.	27¼ in.	27¼ in.	3/4-in.	3/4-in.
		33 per cent.	9¾ in.	10 in.	3/8-in.	3/8-in.	1/8-in.	1/8-in.	1/8-in.	1/8-in.	26⅛ in.	26 in.	1 1/8 in.	1 1/8 in.
		25 per cent.	7⅞ in.	7½ in.	7/16-in.	7/16-in.	3/16-in.	3/16-in.	3/32-in.	3/32-in.	24¾ in.	24¾ in.	2½ in.	2½ in.

Hobart Allfree Valve Gear on Kansas City Southern Locomotive.

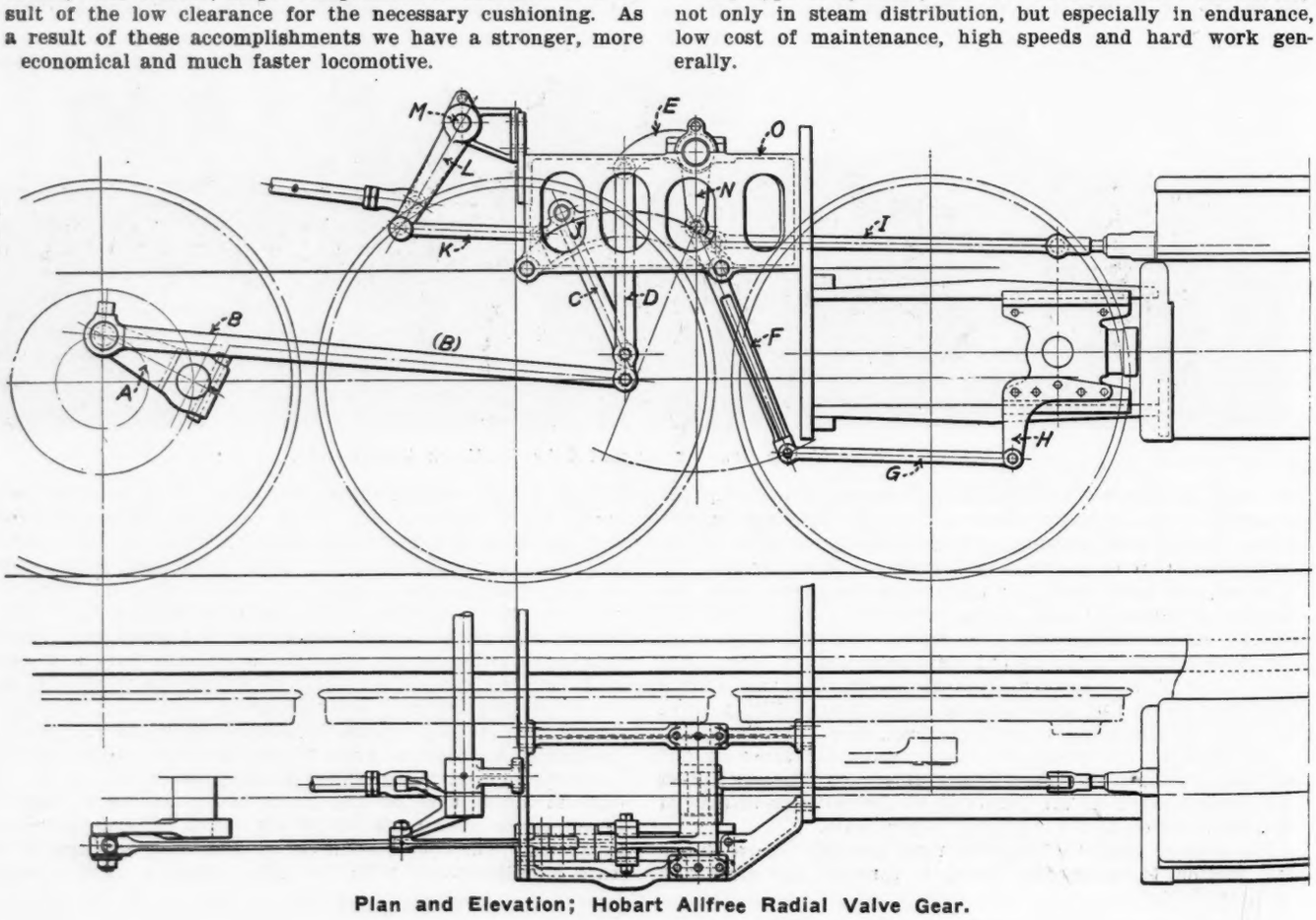
exhaust area is open, and consequently an unusually quick and free exhaust is obtained, justifying a material increase of the exhaust nozzles. Then through the delayed closure a very long turning effort is obtained, materially lowering the slipping tendency, as the pull is long and steady, instead of the short jerky effect due to an early release and early closure. In fact, a result more nearly approaching a continued torque is secured, as is had with the electric locomotive. This principle explains the material increase of tonnage obtained with this valve. The late closure also opens the way to a reduction of cylinder clearance amounting to a difference ordinarily between 10 to 12 per cent., and a standard of 2½ per cent., and yet, notwithstanding the unusually late closure, ample compression is obtained as a result of the low clearance for the necessary cushioning. As a result of these accomplishments we have a stronger, more economical and much faster locomotive.

It has been proven by numerous tests that an engine with this valve will do more and better work with 175 lbs. of steam than a standard engine of the same size and weight will do with 200 lbs., or, in other words, the engine that requires 200 lbs. of steam before conversion will do more and better work with 175 lbs. of steam after conversion, using the same size cylinders. A number of engines whose tonnage rating over a division was 800 tons are hauling, since conversion, 950 tons and making better time than was made with 800 tons before conversion.

While the new gear has been especially designed to operate with special cylinders and valves in order to complete the system for a more perfect steam utilization, it is applicable to any type of cylinder, and will be found more satisfactory not only in steam distribution, but especially in endurance, low cost of maintenance, high speeds and hard work generally.



Hobart Allfree Radial Valve Gear.



Plan and Elevation; Hobart Allfree Radial Valve Gear.